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ABSTRACT

This collection of essays is the second volume in a series of working papers from Lehigh University Technology Studies Resource Center. The papers focus on the ethical implications of engineering as a profession and the current problems associated with the public responsibility of engineers. Issues that relate to the ethical dimensions of conflicts of interest, competitive bidding, employer-employee relationships and private interests within corporate processes are discussed. Collectively the essays offer a set of perspectives on the development of a practical ethical approach to engineering and current technologic society. Papers in this volume include: (1) "Ethics in Engineering: A Pressing Need" by Stephen Unger; (2) "Principles of Responsibility for Professional Practice" by Charles Reynolds; (3) "The Irrelevance of Ethical Theory: The Virtue of Casuistry" by Karl Pavlovic; (4) "Engineering and Ethics: Some Comments" by Joseph Volpi; and (5) "The Nature of Engineering Ethics: Preliminary Considerations" by Heinz Luegenbiehl. (ML)

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Working Papers
Technology Studies Resource Center
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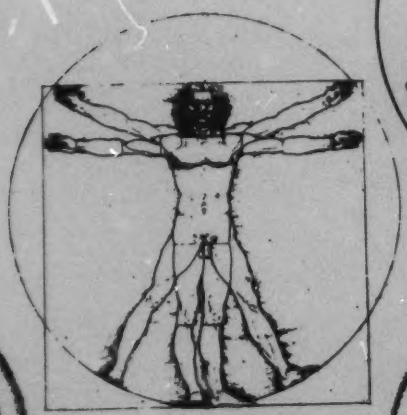
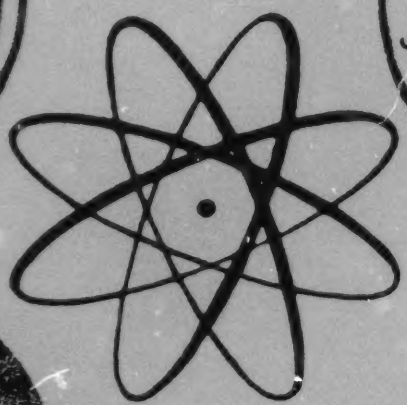
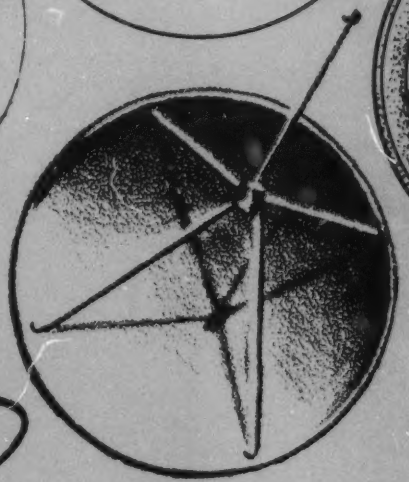
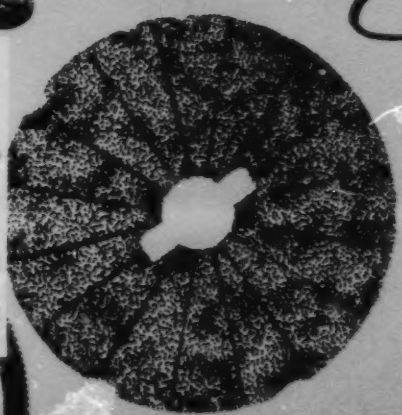
ETHICS AND ENGINEERING









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TECHNOLOGY STUDIES RESOURCE CENTER

WORKING PAPERS SERIES

Stephen H. Cutcliffe, Editor

VOLUME 2, FEBRUARY 1985

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COVER DESIGN

The cover was designed by Alan Cutcliffe to represent the broad spectrum of topics in both the humanities and technologies covered in this working papers series. The central symbol of daVinci's universal man is juxtaposed with a multiplicity of images associated with the humanities and technology, all echoing the circular shape, hence the globe, gear, computer disk, grindstone, flower, atom, satellite dish, wheel, and sun. The choice of images also juxtaposes the modern with the historical, the philosophical with the practical, an intentionally thought-provoking contrast of scale and topic, corresponding with the intent of the series itself.

Copies of the TSRC Working Papers are available prepaid at $6.00 each (checks payable to Lehigh University) through the Office of the Bursar, Alumni Memorial Building #27, Lehigh University, Bethlehem, PA 18015.

CONTRIBUTORS

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PREFACE

"Ethics and Engineering" is the second in an ongoing series of working papers being published by Lehigh University's Technology Studies Resource Center. The publication of this working papers series, in association with the Regional Colloquium for Technology Studies which serves as the major source for volumes in the series, is designed to help foster a regional research community in this field. It is our hope that the publication and distribution of papers from each colloquium in a working papers format will stimulate new research, facilitate wider dissemination of research and ideas, encourage peer response and adoption of ancillary texts for appropriate courses, and increase opportunities for these papers to be selected for subsequent publication in formal journals and anthologies after appropriate revision.

The Regional Colloquium for Technology Studies and the associated working papers series are activities of Lehigh University's Technology Studies Resource Center. The TSRC is engaged in the creation and dissemination of materials and programming that will lead to a greater understanding of technology on the part of a wide range of audiences, especially their understanding of the mutual interaction of technology and social institutions and values. Among other functions, the Center serves as a focus for academics from all disciplines to collaborate in pursuing research and educational opportunities in technology studies, both with academic colleagues and in conjunction with non-academic sponsors. The Regional Colloquium and working papers

series are just two vehicles within the Center's many activities that are intended as means for expanding our understanding of the social context of technology in today's world.

The Colloquium from which most of the essays in this volume were selected was organized around the ethical implications of engineering as a profession. While engineers have long been interested in the notion of codes of ethics appropriate to their own conception of engineering as a profession, it is only recently that this interest has blossomed into an appreciation on the part of philosophers that ethical issues are commonly raised by the practice of engineering. Current problems associated with "whistle blowing" and the public responsibility of engineers have focused new attention on the ethical dimensions of conflicts of interest, competitive bidding, employer-employee relationships (especially those concerned with confidentiality, proprietary information, employee loyalty) and perhaps most importantly the dilemmas posed by individual engineers participating in a corporate process driven by private interests but having profound social consequences.

In the opening paper, Stephen Unger seeks first to explicate the nature of technology and its relationship to contemporary engineering. From this he moves to a discussion of the control of technology and then extrapolates outward from the specifics of professional practice to a broader set of ethical principles for the engineer. Taking a somewhat different tack, in the second paper Charles Reynolds adopts a broad perspective for analyzing professional ethics generally and then moves inward to engineering in particular, by drawing on his conception of the

professional responsibilities of higher education. Finally, Karl Pavlovic calls for a "casuistic," or detailed case study, approach to engineering situations that call for ethical decisions. This body of cases could then be drawn on in order to formulate a set of general principles for guiding technological action.

Commentator Joseph Volpe admirably pulls these three papers together by analyzing the root causes of the three authors' "sense" that something is basically wrong with, and in, the conduct of professional engineering, which in turn suggests a need for moral concern and direction. He observes that these concerns stem, on the one hand, from the obvious enormous social impact of contemporary technological enterprises and, on the other hand, from the fact that the very nature of the organizational environment within which most engineers work is such that moral direction and control is well nigh impossible. As a result, Volpe questions whether the three authors' prescriptions for engineering "codes," "principles," or "casuistic cases" to serve as moral guides for engineers are by themselves sufficient, without deeper organizational changes in the very enterprises which seem to lie at the heart of the problem.

The concluding essay in this volume, by Heinz C. Luegenbiehl, was originally published in the Science, Technology and Society Newsletter (June 1983), but because of the parallel nature of some of the questions raised in it, it seemed fitting to reprint it here. Luegenbiehl argues that engineering ethics, although it overlaps the concerns of professional ethics,

business ethics, and technological ethics, cannot be assimilated directly by any one of these three; nor can it be a simple combined statement of the three taken together. Rather, Luegenbiehl concludes, we need a new, "unique" and sophisticated model that will serve the particular needs of engineering.

Taken together, these five papers offer a set of interesting perspectives on how we might best evolve a practical ethics of engineering, one which would serve the complexity of today's technological society.

I would like to thank Professor David Schenck, formerly of Lehigh's Department of Religion Studies, for his help in the planning and early coordination of the Colloquium and Mary Jo Carlen for her assistance in the preparation of this volume.

Comments or queries on the Working Papers Series, the Colloquium for Technology Studies, or the Technology Studies Resource Center are welcome and may be forwarded directly to me.

Stephen H. Cutcliffe
Director, TSRC
Lehigh University

ETHICS IN ENGINEERING: A PRESSING NEED

by

Stephen H. Unger

I want to begin by establishing a position with respect to technology and society. There are people who are considered critics of technology who take a very dim view of the whole enterprise. Listening to them one might feel that the world would be better off if we could only return to some pastoral utopia that may have existed in the 13th century. I want to disassociate myself at the outset from that point of view. There are also people who consider that there is an inexorable movement of technology over which mankind has no control: that is, that each development proceeds from each preceding development; that our scientific knowledge advances in sequence as discoveries are made; that there is a natural order of these developments that we cannot control. There is a sense that if it is possible to make something, it will be made. If it is possible to put something into production, it will be put into production.

The people who hold this attitude can be broken down into two groups: one of which thinks this is disastrous --Ellul would be a typical person in this category, feeling that this is leading us toward dehumanization and monstrous ends-- and others who feel that while we cannot control what is going on, that it is okay, because everything will turn out all right. They feel we do not have to worry about problems of technology and society because natural forces are operating that will weed out the bad uses and lead to good uses.

I think both of these views are pernicious. They lead to a passive attitude and encourage us not to think about the consequences, on the one hand because everything is going to turn out all right, and on the other hand because there is nothing we can do about it, we might as well sit back and enjoy the ride to doom.

I do not think that these are justifiable positions. I believe we have good evidence that it is possible to make choices and that indeed choices have been made. In a sense you cannot prove this because we have only one history book, we have only one sequence of events that actually took place. We cannot go back and see what other path history might have taken. If we look back about fifteen years ago, there was a debate about whether to proceed with the supersonic transport. It looked like it was going to be an example of something that could be built and was therefore going to be built. Hundreds of millions of dollars had been invested in the project in the United States. Then people began to see serious problems with the project, and a major public debate over the issue emerged. Eventually, in this country, the project was discontinued. The French and Russians either did not have the same debate or the people against the transports lost the debates. I suspect at this time they look upon us with envy because the supersonic transports have not turned out to be a very happy application of technology, which may in part be due to increased fuel costs making them less economic than anticipated. But in any case they have not caught on very well. We have also had the example of the ABM defense system, which was on track in this country around 1970 but as a

result of serious discussions was abandoned. Now of course we are witnessing a resurgence of the same issues in another form, and I think we are going to see that debate come up again.

It seems clear that these situations could have gone either way in the United States. The SST might well have been built or the ABM might have become a major defense system, but because some people raised sufficiently strong objections they were not carried out. I think this gives us an indication that we have at least some control over what is going on. If you do not make the assumption that one can control what is going on, then obviously we will not control what is going on. It is a self-fulfilling prophecy. If we do not believe we can do anything about it, then we will not. Even if you are in doubt about whether you can change the course of events, I believe it is more fruitful to assume you can and then just do the best job possible. I take this position: that it is possible to control technology and its applications.

The next point I want to make concerns the responsibility of engineers in the process of controlling technology for the benefit of mankind. We could of course broaden the discussion to consider other kinds of people or to other responsibilities of engineers such as doing a good job for their employers and treating their colleagues ethically, etc., but I am going to focus on the idea of controlling technology for the benefit of humanity.

It is probably not necessary to dwell on the fact that technology has great benefits to bestow or that there are great

problems that can also arise due to the misuse of technology in many ways. We only have to look at examples of collapsing bridges and buildings or crashing airplanes to see one aspect of the bad side. As far as the good side goes, all that should be necessary is to compare our lives with those of people living several hundred years ago, where just staying alive in the winter was no simple matter. They also did not have the leisure that is available to us today, let alone such miracles as television, which of course has its down side. As an aside, I think this is an example of a misuse of technology for which engineers are in no way responsible. It is clear to me that there are other institutions in our society that are to blame for misusing this miraculous invention by reducing it to a vehicle for selling toiletries and for showing ghastly programs that dull the minds of those who watch them.

When we look at negative aspects of technology, there are three categories. The first involves poor implementation, where a worthwhile project that could have been carried out in a purely beneficial way goes wrong due to some mixture of blundering, incompetence, and corruption. Examples might include collapsing bridges or the DC-10 incidents. Probably that is the simplest problem to deal with, at least conceptually, because no one advocates building defective products. Where we get into problems is when we try to decide how much risk is acceptable. How much should we spend to reduce hazards below a certain level? That is a matter of controversy, but it is a relatively simple matter compared to category two --deleterious side effects.

Here you have a technology that is basically beneficial, but

which has harmful side effects. The chemical industry is full of such examples. For example, due to having to dispose of wastes which are generated in the course of producing beneficial products, we have serious environmental problems that threaten the health of people and make the quality of life less pleasant. For example, setting aside health problems for the moment, if you just drive down certain stretches of the New Jersey Turnpike you have to close your car windows, and it makes that trip less pleasant. In addition, if you live anywhere down wind, it becomes a very serious problem. Some of these deleterious side effects are inevitable. A good example of that is DDT, which is basically a beneficial product that helps us get rid of pests. It seems to be inevitable that, if DDT is used, it is going to get into the environment, persist for a long time, concentrate in the food chain, and cause harmful effects. It is hard to see how you could use DDT or even modify it and avoid those problems. The choice is whether its primary purpose is worth the harm that it does. You simply make a decision one way or another.

Other examples of side effects are of a different caliber. That is, they may be avoidable. For example, when we burn coal we produce sulfur which is a major component of acid rain, but it is not inevitable that we produce sulfur compounds when we burn coal. There are technological solutions to that problem. There are processes that produce very little sulfur, and there are processes for filtering out sulfur compounds in the stacks. Here we have a side effect not inevitably associated with the principal effect. However, another problem associated with

burning coal, or any other fossil fuel, is that of carbon dioxide emissions, which affect the level of that compound in the atmosphere. This is unavoidable; there is no way to burn coal without producing carbon dioxide.

In some cases the side effects should have been anticipated at the outset. It would have been reasonable to say that people should have figured out that such and such would happen. In other cases it may not be possible. There are of course in-between cases depending, for example, on how much study was done.

The third category of problems is the most difficult to deal with and this is the area of ill conceived ends, where the purpose of the technology is believed by at least some people to be pernicious. The reason this is such a difficult area is that there is a lot of room for disagreement among people. A good example is producing hard liquor. If an engineer is asked to design or improve apparatus used for making whiskey, there are some people who would say that this is fine, but on the other hand there are people who believe alcohol for drinking purposes is pernicious or sinful. Both groups of people are in general sincere, thoughtful, ethical individuals. There is no way that anyone can prove which group is correct. There is no definition of correctness in this situation.

There are other instances such as designing apparatus for execution --a better electric chair or a gas chamber-- that, depending on one's view of capital punishment, could be seen as an ill conceived end or not. Probably the most important example of this category has to do with military equipment. Some people feel building ICBMs are very important because they are necessary

to the defense of the country and to deter aggression, while other groups believe that if you build enough of these deadly missiles, it is inevitable that they will eventually be used and that we will incinerate vast numbers of people, most of whom are by any reasonable definition innocent. Recent studies have shown that the very existence of humanity is at stake. If several hundred of these missles were to be detonated, we could have a nuclear winter effect that might indeed exterminate all of mankind. Here we have two groups of people, both of which include ethical and honest people, coming to different conclusions as to the merits of the end about which we are talking.

Differences in viewpoint may be distinct from questions of values. That is, it is possible that people might have quite similar values but come to different conclusions because they have different estimates of the world and of probabilities and likelihoods that are not easy to establish in a precise manner. Despite having similar values, they may have different views of the psychology of people and the way they behave. For example, they may disagree as to the effects of threats. Some people believe that threatening with weapons will cause the other side to back down, while some believe that it will only lead the other side to increase its own forces. There are many reasons why we might agree or disagree as to whether a given technology is or is not beneficial.

Now let us look at the role of engineers in this problem. It has been said with respect to airline disasters that pilots feel they are in a particularly important position, because they

are the first ones to hit the ground in a crash. In a certain sense engineers are also in the front seat when it comes to the development of technology. The engineer in several respects has a special position in this process. An engineer directly involved in a project not only has special knowledge but has it sooner than anybody else. Such an engineer is in a natural position to consider the ramifications of what is being done and clearly, by virtue of being part of the process, has a lot to say about the implementation. The question of poor implementation is one with which the engineer on the project is uniquely qualified to deal. With respect to side effects, the engineer on a project is not as intimately involved but, nonetheless, because of detailed knowledge of the technology, is certainly in a good position to identify possible deleterious side effects. Again, the engineer involved in the development stage knows about the process well before most others. Finally, when it comes to ill-conceived ends, the engineer is in a position to assess what is going on at a relatively early stage.

This is not to say that <u>other</u> people do not have important and frequently crucial responsibilities in such matters, but here we are just looking at the engineer's role. However, their unique role has associated with it a special responsibility to try to prevent the misuse of technology.

In our world today decision-making is a very complex process. Certainly one of the characteristics of our era is that huge organizations involving hundreds of thousands of people are frequently involved in complex enterprises where no one person is really in charge. We do not have a model of nice tree-like

structures with one person at the top with responsibilities branching out and down as in a military command structure. That is not the way the world operates in most instances. We have very complex organizations with different power structures all involved in producing important products and results. Within each organization you do not have a well-defined flow of command from the top to the bottom where each individual subdivides and passes down orders. That is not a good model of many real world situations, and it is certainly not a model of how complex technologies are developed and are deployed.

What actually happens is that in a complex process decisions made by certain individuals affect the decisions of other individuals. For example, someone may have a request to a subordinate to design a sub-unit of some sort. What typically happens is that the request is not in a very precise form because what is happening is not well-defined. So a general request is issued to design or build a device to do such and such, something along these lines. The individual working on the project may discover that certain elements of the request are impractical to implement or may discover that other things can be done in addition to what is requested. Both possibilities exist, as does the possibility that something should be done in a dramatically different way. This can happen in a major way or a minor way and may then involve a flow of information back up the organization with discussions along the way that may affect other parts of the complex project. When it comes to the interfaces between sub-projects within a larger project there are often a lot of

disputes and problems. It is often a fuzzy picture, not one that is at all clear.

A consequence of this is that responsibilities also often become blurred and diffused. It is not easy when something goes wrong to say who is responsible for the problem --whose decision led to a given disaster. What is necessary is for large numbers of people in these organizations to take on responsibility and to do the best they can, rather than assuming they are just cogs in a machine. They are not just part of a regular network executing orders given by some omniscient superior. That is not the way it works. It is necessary for professionals to take a broader responsibility for what they are doing and, within reason, to look at what others are doing. They should try to get as broad a picture of the project as possible so as to understand the consequences of the decisions being made.

When we talk about trying to implement this sort of responsibility, it is useful to try to codify what the responsibilities are of the individuals involved. This is where codes of ethics are useful tools in clarifying our thinking. They should not be thought of in a rigid way as enforceable pieces of legislation. While it is true that in certain situations it is possible to discipline people for violations of ethics rules, this is not really their primary purpose. Their primary purpose is of an educational and inspirational nature. That is, people who want to do the right thing can get some sort of general guidance as to their responsibilities. Ethics codes can be useful tools in getting people to think about such issues.

Given this purpose, how do you come up with a reasonable set

of rules of behavior or a code of ethics for engineers? We have to realize at the outset that there is nothing homogeneous about the set of all engineers. They differ amongst themselves in roughly speaking the same sorts of ways that the rest of the population differs. Given any particular social or political issue you will find a spectrum of views among engineers comparable to that among other groups. While studies have shown that, on average, engineers may be somewhat on the conservative side, you can certainly find substantial sets of engineers with just about any point of view that you might choose. Therefore, if you want to have a code of ethics that is acceptable to this profession, it has to be based on principles that are widely or almost universally held. This implies that it cannot be a code of general behavior including all values. For example, it should not tell people what they should think about weaponry. If it attempts to resolve issues like that, it is going to fail, because, while it will please some groups, others will find it unacceptable. This might lead us to conclude that it is impossible to come up with anything non-trivial in terms of a code of ethics, because the only things we can hope to agree on will be of such an obvious and simple nature that no useful rules could be dervied from them. I do not think that this is the case at all.

Despite the fact that engineers hold as widely divergent sets of values as do other people, there is a commonly shared core that is quite adequate to use as a basis for constructing a meaningful set of ethical guidelines. I shall try to boil this

down to a set of three fundamental precepts that are relevant to the question of general social responsibility. Although it must be kept in mind that none of these are absolute.

1) Do not harm people. It is necessary, however, to keep in mind that in any given real situation with a multiplicity of effects it may be impossible to keep from harming somebody, or that the choice may be between harming somebody or violating some other basic precept.

2) Do not deceive. This includes not lying, not omitting significant information, not falsifying data, not telling people you are going to do something that you cannot do or do not really intend to attempt. This is particularly significant for people in the sciences and engineering because in their work they must rely on other people telling them the truth. If they must check or verify every statement presented to them by other individuals, it becomes impossible to operate. It is necessary to be able to rely on other people and assume that they are going to carry out their end of the project.

3) Achieve and maintain professional competence. This is not always thought of as an ethical point, but in this instance it really is ethical. It does not matter whether a building collapsed because an engineer took a bribe and used inferior materials or because the engineer made an error in specifying the size of a beam. Incompetence and other forms of unethical behavior can have in general indistinguishable results, so competence becomes an ethical point.

If you accept these as three underlying precepts that are not going to be debated by anybody, and it is difficult to see

how anybody would argue that these are not important moral points or that each by itself should not be violated without strong counter-arguments based on other considerations, then we can formulate some useful ethical rules. For example, engineers shall regard their responsibility to society as paramount and shall:

1. Inform themselves and others, as appropriate, of the consequences, direct or indirect, immediate and remote, of projects they are involved in.

This addresses itself primarily to the question of side effects. One has an obligation to do a reasonable amount of work, although there are limits as to how far one can go in trying to foresee all possible consequences.

2. Endeavor to direct their professional skills toward conscientiously chosen ends they deem, on balance, to be of positive value to humanity; declining to use those skills for purposes they consider, on balance, to conflict with their moral values.

Engineers make their decisions on their own set of moral values, which means different engineers could arrive at different conclusions with respect to particular projects. What they are obliged to do is to make the effort. What would be unethical would be to work on a project without having given any thought as to whether on balance it is a good thing.

3. Hold paramount the safety, health, and welfare of the public, speaking out against abuses of the public interest that they may encounter in the course of professional

activities in whatever manner is best calculated to lead to a remedy.

Normally one would work within one's organization as much as possible to work out problems. If this does not lead to a satisfactory resolution, then it may be necessary to go outside and in a cool, professional manner use other channels to prevent some serious harm to the public.

4. Help inform the public about technological developments, the alternatives they make feasible, and possible associated problems.

5. Keep their professional skills up to date and be aware of current events and societal issues pertinent to their work.

6. Be honest and realistic in making claims and estimates, never falsifying data.

This is not controversial in the abstract, but there are a number of cases where individuals suffered quite a lot when they tried to live up to this.

7. Associate themselves only with honorable enterprises.

8. Contribute professional advice to causes they deem worthy, where this seems appropriate.

Given the importance of engineers behaving in accordance with the rather demanding set of rules outlined above, it is essential that societal mechanisms be established to support those who find themselves in difficulty as a result of having done so. Only recently, for example, have any of our courts begun to recognize the <u>right</u> of engineers to act ethically. It remains the case that engineers are still vulnerable to

their employers (often government agencies!) when they call attention to abuses of the public interest. Because most engineers are employees, these problems occur when there are disputes between engineers and their managers or employers. There are many instances such as the BART case, the Baslow case, etc. where the reward for upholding the public interest was to be fired. It is important to consider what changes are necessary in our legal system and what other institutions could be set up to ease this problem. Some progress has been made on this, but anyone working in the area of engineering ethics must call attention to this particular aspect.

Reference

Much of the material discussed in this edited version of an oral presentation is treated more thoroughly in:

Unger, Stephen H., Controlling Technology: Ethics and the Responsible Engineer (N.Y.: Holt, Rinehart and Winston, 1982).

PRINCIPLES OF RESPONSIBILITY FOR PROFESSIONAL PRACTICE

by

Charles H. Reynolds

At the University of Berlin in 1918, while still vividly aware of the devastation wrought by World War One, Max Weber presented two lectures on professional ethics. In these lectures on "Politics as a Vocation" and "Science as a Vocation," Weber --who was without question one of the leading minds of modernity, and one of the founders of the social sciences-- passionately argued for a professional ethics of responsibility predominately as a replacement for, and a correction of, the subjective ethics of intention which he correctly argued was no longer adequate for making tough policy decisions in the complex, socially differentiated modern world. Good and admirable intentions, Weber claimed, can lead to irresponsible public decisions when the consequences of actions are not viewed as having a level of importance sufficient to guide responsible decision making. Leaders in public policy, Weber proposed, with his attention focused primarily on politics and the sciences, must develop an approach to ethical reasoning that gives appropriate weight to the social consequences of their vocational and professional decisions.

There is something ironic about interpreting Weber as adumbrating a new form of professional ethics. For Weber, after all, is more often cited for his commitment to "value free" research and teaching. Unfortunately, it would take us too far afield to get into a careful analysis of Weber's position on

these apparently contradictory stances. Here I will only remark that Weber considered detachment, passion, perspective, and intellectual and personal integrity --as well as a concern for consequences-- as critical aspects of an ethics of responsibility.

Weber issued this call for a new form of professional ethics before the world experienced the horrors of National Socialism, before the first atomic bombs were manufactured and then exploded over Hiroshima and Nagasaki, before humans and communication satellites would be orbited in space, before the development of the micro chip that would revolutionize how information is processed and exchanged, before deep sea mining would be conceived as possible; and, yes, Weber issued this call for a new form of professional ethics before humans had the capability of manufacturing new life forms (that life which in the U.S. one can now have patented).

I do not believe that we can specify or develop a set of moral rules or ethical principles that can replace the need for sensitive and discerning judgment. The most we can hope for is to specify or develop those rules or principles that can assist discerning judgment. But even here I am reminded of one of my favorite passages in the Tao-te ching:

> Therefore when Tao is lost, only then does the doctrine of virtue arise. When virtue is lost, only then does the doctrine of humanity arise. When humanity is lost, only then does the doctrine of righteousness arise. When righteousness is lost, only then does the doctrine of propriety arise. Now, propriety is a superficial expression of loyalty and faithfulness, and the beginning of disorder.

Propriety, li, is used here in part as a challenge to the Confucian emphasis on rules and standards of behavior. Indeed, in an important sense propriety here means ethical principles. It is only by relating ethical principles to the deep values on which they rest that we can hope to avoid superficial and pious principles that have a mistaken bearing on decisions and conduct. This deep insight of the Taoist tradition is one that we forget at our peril as we attempt constructive work in professional ethics.

Some of you are experts in certain aspects of the science and technology that have made our world such a different world than the one Weber knew so well. But even those of us who are not scholars of the sciences and technologies that have made our world a heavily armed global village can experience this new reality daily as we watch news programs beamed over communication satellites, work at our home computers, use computers and telephones to communicate with people almost anywhere in the world, or view the latest space flight live --or delayed on our home video recorder.

The learned professions have had an unprecedented influence in changing our earthly habitat during this century. We must keep these changes in mind as we explore principles of responsibility appropriate to the learned professions. An ethics that fits the learned professions of, among others, law, psychology, engineering, medicine, ministry, the helping professions, and higher education, needs to be sufficiently concrete to provide guidance for those judgments and actions that an individual professional must make as well as sufficiently

abstract to provide guidance for an assessment of the broad social impact of a profession. It was precisely this tension that Weber was rightly insisting upon in his two lectures at the University of Berlin in 1918. It is a mistake to come down simply on the pole of the concrete and the particular or on that of the abstract and the universal in our constructive work in professional ethics.

Although it would also be possible to make this point about the importance of holding the concrete and abstract in tension with references to the writings of philosophers as different as William James and John Rawls (see James's essay "The Moral Philosopher and the Moral Life," and see Rawls's interpretation of his notion of "reflective equilibrium"), I want to make a related claim in a different way. I choose this alternative because I believe it is important for us in this type of setting to recall that moral and religious and political ideas can also lead to major social changes. Do I need do more than mention the names of Karl Marx, Mohandus Gandhi, and Martin Luther King, Jr.? Each of these men related abstract theory to concrete reality in ways that inspired others to transform their world, many of whom have been willing to die for the values at stake in these changes. Now my related point should be clear. It is not important simply for theoretical reasons that the concrete and abstract be appropriately related as we do constructive work in ethics. It is essential at the practical level of agent motivation that these two poles be appropriately related.

As we examine together an ethics of responsibility for professional practice, it will be helpful for us to remember that how the social consequences of the new science and technology are shaped will determine certain life or death prospects for each of us, and possibly for the human species, and possibly even for most or all life forms on planet earth. I am referring here both to the potential destruction produced by a major nuclear war as well as to potential destruction at a much slower pace produced by poorly managed hazardous waste disposal.

In a two day workshop that I recently conducted on values and decision making in higher education at a state university, a faculty member challenged me during some introductory comments with the assertion that, "Since all values are relative and my values are just as good as yours, why should I spend time working on a problem that has no solution. There is nothing that you can teach me about values that has any relevance to decisions that need to be made in this institution. And all of us here know what those decisions that should be made are." Repressing the temptation to ask this professor of economics why he would waste his time at the workshop when he already knew he would not learn anything, I instead said that I would be interested in hearing about the decisions that "all...know" should be made at his university. As you must suspect, there was sharp disagreement on what the critical decisions that needed to be made in that university were, and on who should make the decisions. Those disagreements represented alternative visions of the university's mission which permitted me to identify a range of value issues to explore in the workshop.

In his evaluation of the workshop the next day, the economist said that he had taught for twenty years without having a public opportunity to discuss with colleagues the difference between understanding values as personal intentions (the subjective notion of ethics challenged by Weber), and values as ethical principles. He also said that he had been identifying value diversity with value relativism. Following two days of discussing with colleagues a range of principles and issues requiring value decisions, this professor acknowledged that the value diversity in his university meant that many of his colleagues did not share his judgments about what decisions needed to be made there, and that their disagreements with him were based on value differences that previously had not been openly discussed. Those differences focused on the size of their university in relation to its mission and identity, on the appropriate admissions standards for students, on the importance of faculty research for instructional excellence, on budget priorities for different colleges, on whether or not sufficient effort was being made to recruit minority students and faculty, and on whether or not federally sponsored classified research, or proprietary research that limited the free exchange of ideas, should be permitted on the campus. These issues had been discussed as requiring political and economic choices. The values at stake in the alternative choices had not been focal. To address these important value issues with guidance from an ethics of responsibility, an agent needs (1) a theoretical understanding of moral judgment as an aspect of an

ethics of responsibility, and (2) a knowlege of those middle-range ethical principles that fit an ethics of responsibility.

In the remainder of this essay, I will: (1) present certain principles of responsibility that fit the distinctive learned profession of higher education; (2) draw on the writings of H. Richard Niebuhr and John Rawls to explicate four moments of responsibility that enhance discerning moral judgment; and (3) briefly explore the possible implications of (1) or (2) for how we can generalize outward from an understanding of the professional responsibilities of higher education to rethink the nature and needs of the professional ethics of the learned professions which share a strong commitment to a range of deep values.

Robert Perrucci has concluded a penetrating chapter on "Engineering: Professional Servant of Power" (Friedson, 1973, p. 132) with the observation that:

> The growing centrality of engineering activities in American society calls for a profession that not only has the technical skills to deal with societal problems, but also has both a strong commitment to serve human welfare and the independent power to determine the way in which its talents are used. Our examination of the present structure of engineering, in terms of the persons recruited to the occupation and its internal diversity, suggests that such a profession does not now exist. Engineers now serve dominant industrial and governmental interests, and they do not attempt to determine whether or not their work contributes to pollution, to international tensions, to urban decay, or to the creation of a totalitarian social system.

Unfortunately, with minor revisions Perrucci's harsh indictment could be extended to all learned professions -- including, or perhaps especially, to higher education. Precisely

because the learned professions share certain deep and common problems, we can best assist one another to address our common problems, if we share information on how we as members of particular learned professions view both these problems and their potential solutions. It is for this reason that I am focusing on an ethics of responsibility for higher education, and then suggesting that this proposal be reviewed for possible relevance to the learned professions generally --including engineering.

Engineers as technical systems experts cannot restructure higher education in a way that addresses higher education's needs to become more ethically responsible. And neither can a technical specialist in religious or philosophical ethics critique engineering and give you directions on how to become a more responsible professional. We have a firm basis for cooperation in so far as we share certain deep values as members of learned professions. But we have distinctive responsibilities in relation to our particular social roles and specializations as members of the learned professions. It is primarily the calling of each particular profession to work out its own distinctive way of specifying, nurturing, and enforcing an authentic sense of responsible professional practice. Self-definition is intrinsic to the concept of a profession.

The principles of responsibility listed below are intended as middle-range principles to inform the decision of faculty and administrative staff in higher education. These principles have been formulated over a two year period and have been used in a

number of workshops with leaders in higher education. In addition to being based on experience in a number of workshops, these principles also reflect the author's training and reading in ethical theory.

The Principles of Responsibility

Personal Principles of Responsbility

Every person in an academic community has responsibilities in relation to other persons in that community. In fulfilling these personal responsibilities, you should:

1:1 demonstrate a respect for each person as an individual
1:2 communicate honestly and truthfully with each person

Professional Principles of Responsibility

Every professional employee of an academic institution has professional responsibilities that follow from his or her role. In fulfilling these professional responsibilities, you should:

2:1 assist your institution to fulfill its educational mission by providing a full measure of work for compensation received
2:2 strive to enhance the personal and intellectual development of each person
2:3 be conscientious, thorough, and fair in evaluating the performance of students and professional associates
2:4 conduct your professional activities in ways that uphold or surpass the ideals of virtue in your profession

Institutional Principles of Responsibility

Institutions have responsibilities that follow from their mission and identity. In fulfilling its institutional responsibilities, a college or university should:

3:1 be fair and extend due process to all persons
3:2 have efficient and effective management
3:3 be humane in all relationships while protecting the safety of persons and property
3:4 have a mission statement that reflects its strengths and aspirations in an honest expression of its identity
3:5 have policies that foster a heterogenous community of racial and socio-economic diversity
3:6 assist its members in their professional development while requiring competent performance from everyone
3:7 be a good corporate citizen in its external relations
3:8 have a governance that fosters and protects academic freedom

Public Principles of Responsibility

Colleges and universities have responsibilities to serve the public interest and contribute to the common good. In fulfilling their public responsibilities, colleges and universities should:

4:1 serve as examples in our public life of open institutions where truthful communications are required
4:2 preserve human wisdom while conducting research to create new forms of knowledge
4:3 serve the public interest in ways compatible with being an academic institution
4:4 enhance the development of international understanding
4:5 promote a critical appreciation of the creative activity of the human imagination

Political Principles of Responsibility

Colleges and universities have a responsibility to exercise their political influence in ways appropriate to their distinctive identity. In fulfilling their political responsibilities, colleges and universities should:

5:1 interpret academic values to their constituencies
5:2 promote forms of polity based on an equal respect for persons
5:3 promote policies that increase access to higher education for the poor, minorities, and other underserved populations
5:4 help to develop fair and non-violent means of resolving conflict between persons, groups, and nations
5:5 nurture a community of responsibility that is sensitive to the needs of future generations

Chalk, Frankel, and Chafer (1980, p. 51) have suggested six criteria for assessing "the relationship between ethical rules and a professional society's willingness and capability to deal with matters of professional ethics." These six criteria are:

(1) Applicability --This refers to the responsiveness of the rules to specific problems. What is elegant in theory can sometimes be elusive in practice. How effectively can the rules be applied to real-world problems? Are some ethical problems not likely to be resolved by an approach based on rules?

(2) Clarity --Are the rules sufficiently clear to provide a basis for the responsible exercise of professional authority? Ambiguity is likely to breed confusion and frustration and, as a consequence, may invite neglect. Moreover, clarity is especially important in those cases

where the rules are expected to play a role in the adjudication of grievances.

(3) Consistency --Are the rules internally consistent? Are there logical contradictions within or between rules?

(4) Ordering --Does the statement of ethical rules provide a means of setting priorities between two or more rules which, although not prima facie inconsistent, when applied in practice will require the professional to choose between conflicting obligations.

(5) Coverage --This refers to the scope of actions and situations addressed by the rules. Are the rules silent on matters of serious ethical concern? Do they overemphasize matters of convenience, etiquette, or expediency at the expense of more pressing issues?

(6) Acceptability --Do the rules express proper ideals? Should they be accepted as ethically prescriptive?

As I will indicate below, I do not have good reasons for proposing priorities for the principles of responsibility. The principles of responsibility otherwise are intended to meet the criteria suggested by Chalk, Frankel, and Chafer.

It is inadequate, however, to state principles of responsibility and not relate those principles to an ethics of responsibility. H. Richard Neibuhr gave a more systematic formulation to Max Weber's notion of an ethics of responsibility. A responsible agent, according to Neibuhr, develops the capacity to discern the fitting response in a situation requiring moral choice. His notion of the fitting response by a responsible agent includes, but is not reducible to, Weber's emphasis on taking account of the consequences of actions. Niebuhr (1963, p. 65) briefly characterized his notion of an ethics of responsibility as: "The idea or pattern of responsibility, then, may summarily and abstractly be defined as the idea of an agent's action as response to an action upon him in accordance

with his interpretation of the latter action and with his expectation of response to his response; and all of this is in a continuing community of agents." I will need to explicate these four moments of responsibility. But first, a brief review of Niebuhr's metaphorical analysis of three approaches to ethical theory will help us to appropriate key aspects of his work.

In lectures presented at the University of Glasgow in the Spring of 1960, when feminist consciousness was at a low ebb, Niebuhr (1963) described the metaphors underlying three different approaches to ethics as those of "man the maker," "man the citizen," and "man the responder." Ethics based on the metaphor of "man the maker" assumes that every human action aims at some end. These teleological theories assume that the goal of moral action is to maximize certain goals or ends (teloi) of action. The aim of moral action may be understood in terms of the greatest good for the greatest number of people, with pleasure the index of what is good, or may have the production of some other "good" as the ultimate criterion of right action.

John Stuart Mill is the preeminent example of a philosopher who interpreted moral theory with the aid of this metaphor of "man the maker." Utilitarianism continues as one of the most persuasive forms of moral reasoning primarily because it is grounded in this image of the human to which all humans can relate. The simple maxim of "the greatest good for the greatest number" appears almost self-evident as a reasonable guide to moral decisions. But, as Niebuhr's analysis reveals, it is the simplicity of utilitarianism that fails to fit the complex nature of moral discernment.

"Man the citizen," Niebuhr's metaphor of human action when governed by laws and rules, is presented as the clue for understanding the deontological tradition of moral reasoning. Human communities require laws and rules to restrain and guide the actions of their various members, if a basis of cooperation is to be achieved among people who have different desires and aspirations, or different teloi. Deontological ethics focuses on obedience to the moral rules instead of the achievement of common goals. Immanuel Kant is the preeminent example of a philosopher who interpreted ethics primarily with the aid of the metaphor of "man the citizen." Rawls also belongs in this tradition of ethics, which is one reason why his work has been so influential in legal and political theory.

"Man the responder," Niebuhr's metaphor of human action governed by the concept of the fitting, is presented as the clue for understanding the ethics of responsibility. In developing his ethics of responsibility, Niebuhr focuses on the qualities of discerning judgment that enable an agent to respond to a situation in a fitting way. Niebuhr characterizes four distinct moments of discerning judgement. The first of these moments is that response an agent makes to external factors in a situation that require action. What is going on? To what is one being summoned to respond? Niebuhr's existential insight here is that one does not volunteer for ethical dilemmas; rather, one finds oneself confronted with external forces that impinge upon one and require a response.

If you recall difficult ethical issues that you have

confronted in your professional role, I think you will agree that the element of response to external factors acting upon you represents a critical moment for discerning judgment. It is essential that one develop the capacity to react to actual external factors instead of reacting in routine ways that fail to distinguish a new situation from a similar but in fact different previous situation. A disposition to respond to novel external factors without becoming closed or defensive is a critical first moment in discerning judgment. An insecurity that makes it difficult for one to acknowledge the reality of one's actual environment, a lazy or unquestioning mind which does not explore one's actual world, and an ignorant or uninformed mind which cannot comprehend the reality of the actual world can each contribute to failure in this moment of discerning judgment.

The act of interpretation is the second moment in discerning judgment. The responsible agent first identifies --and then interprets the significance of-- the external factors acting upon him or her. For Neibuhr, this moment requires an imaginative ability to discern the fitting response to a particular situation while being aware of the complete context of the decision. Here it is necessary to supplement Niebuhr's important work on moral discernment with the principles of responsibility.

The principles of responsbility identify relevant and salient factors that one should consider in making an ethical decision. But the principles can at best provide guidance for a discerning judge. An element of risk and creativity is always involved in interpreting a situation with the aid of the principles of responsibility. Furthermore, it is possible for

reasonable people to disagree over which principles apply in which situations. But the principles can assist those who do disagree to explain the reasons for their disagreements to one another. Ideological rigidity, on the one hand, and the absence of commitments, on the other, are the most likely causes of mistakes in this moment of discerning judgment.

The third moment in discerning judgment is an agent's imaginative anticipation of responses to his or her decision. For Niebuhr, this moment in discerning judgment includes Weber's commitment to take account of the consequences of an action; but unlike utilitarians, the claim is not made that the morality of the action depends exclusively on certain goals or outcomes to be achieved. The being of the agent --his or her character-- is valued by Niebuhr in ways that do not depend on the consequences of the agent's actions. Moreover, the principles of responsibility --as independent right-making characteristics of a discerning judgment-- make a claim on an agent in ways that do not depend exclusively on their contribution to some notion of a greatest good. A legalistic adherence to rules without regard to their social consequences, or an antinomian focus on social consequences without respect for rules or principles, can distort this moment of discerning judgment.

The fourth moment in discerning judgment is the responsible agent's recognition that he or she belongs to a community of solidarity with all other being and beings. Responsible agents identify with and belong to the world they react to, interpret, and creatively shape. Responsible agents discern the community

of responsibility they share with all other moral agents and affirm the nexus of responsibility they share with their total environment. A false humility that fails to appreciate the distinctive grandeur of the human proprium as well as a false humanism that fails to grasp continuities and mutual dependencies throughout the world can each distort this moment of discerning judgment.

As I interpret H. Richard Niebuhr's notion of an ethics of responsibility, the four moments here described are intrinsic aspects of discerning judgment. The discerning moral judge imaginatively and sympathetically reviews a situation, examines all features of that situation as fully and impartially as possible, and then risks a response that he or she will stand behind until reasons are provided by some other agent for why the response should be revised in this or that way to be more fitting, everything considered. Because human agents are never fully informed, completely impartial, capable of imagining all potential consequences of an action, or capable of having empathy for all being, Niebuhr advocates a stance of resolved humility --of a willingness to receive corrective insight from other similarly situated agents-- as in solidarity we strive to improve our individual and institutional capacities to make discerning and responsbile moral judgments. The ideal is a cooperative quest and an unfinished skill for human agents.

In his seminal work on justice, John Rawls (1971) uses the traditional metaphor of the social contract to argue for the comparative rationality of justice as fairness over both perfectionists and utilitarian theories of justice. Rawls

argues that under conditions of fair choice two principles of justice (a liberty principle and an equality principle, placed in lexical order) would be selected by rational parties to secure their mutual self-interests, if the subject of justice is understood to be the basic structure of society.

Rawls's analysis and argument moves through four stages where the information available for making rational choices changes as the metaphorical "veil of ignorance" is gradually lifted. The purpose of the veil is to keep the parties who must choose the most rational conception of justice at the moral convention (stage one), a political constitution to secure and protect their conception of justice at the constitutional convention (stage two), and a legislative process for adopting civil laws and procedures (stage three) from being influenced by distorting and irrelevant information. The citizen operates without the veil at stage four, but has moral principles, the constitution, and the laws of the nation as normative guides for rational choice. The citizen may also imaginatively adopt the metaphorical constraints of the veil as a way of obtaining a moral point of view for assessing a particular question of justice related to the basic structure of society.

Rawls's use of the social contract metaphor with the gradually lifting veil addresses at the methodological level potential sources of disagreement for the contracting parties as they choose the normative principles and rules to regulate the basic structure of their society. The veil is combined with the other features of the "original situation" to insure that the

parties choosing among conceptions of justice will share an understanding of the moral point of view, will have a similiar motivational system, and will share the same general information about society that makes a conception of justice necessary to regulate institutional and individual actions. Rawls's metaphorical situation of choice is designed to rule out the sources of disagreement that distort discerning judgment. The result is that in his scheme one person's rational choice will necessarily be a rational choice for any and every other person.

Rawls's famous two principles of justice (1971, pp. 302-303, together with the lexical ordering rules for the principles) are supported by arguments constrained by the ideal conditions specified by the metaphorical and gradually lifting veil. Rawls recognizes the difference between arguments from what he calls "ideal theory" (when the veil is being used) and stage four arguments where the veil has been fully lifted. Indeed, Rawls (1971, p. 303) says, "At some point the priority of rules for nonideal cases will fail; and indeed, we may be able to find no satisfactory answer at all." This is Rawls's recognition that impasses can be reached that limit the capacity of rational agents to locate agreement on important moral issues.

But just as the recognition of these potential impasses does not detract from the importance of Rawls's formulation of principles that represent a conception of justice as fairness, neither should such a recognition keep us from developing princples of responsibility for professional practice. Under the actual conditions of professional practice, such principles may

fail to provide us with the consensus moral guidance that some would prefer to have.

I have reviewed Niebuhr's and Rawls's very different approaches to moral judgment in part to indicate how the approach that I am recommending represents a middle ground. I have enumerated distinct principles of personal, professional, institutional, public, and political responsibility. These proposed principles are not stated in lexical order. But they give more guidance than does a reliance on nurturing moral discernment. These principles are recommended to you for your consideration. It is my judgment that they represent some broad consensus values that distinguish colleges and universities as social institutions, while also representing a range of values that may (or perhaps should) distinguish the learned professions generally.

We would have come a long way toward the establishment of an important new value consensus in our society, if we could develop an ethics of responsibility that academic professionals would largely share with practitioners in the other learned professions. It is my judgment that this is the important new direction that we need to explore in the area of professional ethics. Max Weber recognized the need for this new direction in professional ethics some sixty-five years ago.

We will never know what misery and catastrophes might have been avoided had academics and other learned professionals in Germany made an honest effort openly and publicly to explore their mutual responsibilities. While I do not intend to be melodramatic in this observation, or in any way to suggest that

had the academic professionals and other members of the learned professions in Germany rallied to Weber's summons the Holocaust would not have occurred, I believe a recognition of the deep values shared by the learned professions represents a sign of hope for human civilization in a time when genuine reasons for hope are rare. Those deep values are at the heart of my attempt to state the personal, professional, institutional, public, and political principles of responsibility that are broadly shared by academic professionals. Because my studies of professional codes of ethics give me reasons to believe the learned professions generally share these deep values of respect for persons (the basis for truth telling, confidentiality, informed consent, etc.) and the open quest for truth (the importance of an established body of esoteric knowledge in which one has demonstrated competence), I am optimistic that more extensive research in comparative professional ethics can help to forge an awareness of the deep values that are already shared more widely than we dare believe.

With the future of all we know in part dependent upon our recognition of those deep values that inspire hope, trust, fortitude, humility, justice, patience, and peace, I suggest we call upon one another as colleagues in the university and the learned professions to acknowledge that we do indeed stand firm for these foundational values of respect for persons and the open quest for truth. Because we share these deep values as members of the learned professions, I am confident we can work together to formulate a broad range of principles of responsibility that we will mutually acknowledge as fitting guides to conduct.

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THE IRRELEVANCE OF ETHICAL THEORY: THE VIRTUE OF CASUISTRY

by

Karl Richard Pavlovic

I. Introduction

I confess to a certain amount of misdirection in my title. I hope that by the end of my remarks it will be clear why I choose to use the word "irrelevance," while strictly speaking the word "limitation" might be more descriptively accurate.

I presume that, while some of you are here out of simple curiosity, most of you have some sort of opinion concerning what you take to be the subject or subjects referred to by this peculiar and extremely ambiguous locution, "ethics and engineering" and that these opinions derive from a more than merely academic interest in either ethics or engineering. And that presumption I take as a license to adopt a very broad view of both engineering and ethics in my remarks. I will begin by defining in a tentative way the principal words in my title. I do this with the intention, not of recommending these definitions, but rather only of making clear what I am talking about.

II. Purposive Activity

Every instance of purposive activity, i.e., goal or end-oriented activity, can be collected under one or more of three preliminary categories --categories which can be envisioned as segments lying along a spectrum. First there is what one would probably call purely pragmatic activity in which one tries out various actions more or less at random as possible means to the

end one has in mind. Second, there is what I am inclined to call artful activity in which one is guided in the choice and implementation of means to the given end by a more or less loose accumulation of knowledge (much of it unarticulated, but not necessarily unarticulatable) of the relevant circumstances, means, and end. Third and finally, there is what I want to call systematic activity (which most people, I believe, would call scientific) in which the choice and implementation of means to the given end is essentially guided and shaped by a body of systematically articulated knowledge of the relevant circumstances, means, and ends.

There are three observations that need to be made about this typology for purposive actions. First, the second and third kinds of activities are each essentially a refinement of the preceding kind of activity.[1] Second, the "systematic, articulated knowledge" referred to in the definition of the third category can itself be taken as an end. Third, activities directed towards producing this particular end, "systematic, articulated knowledge," can fall into any of the three categories.

III. Theory

If you speak English, it is agreed, at least among lexicographers, that you ought to refer to "systematic, articulated knowledge" as "theory."[2] I have fallen in with this usage and in fact use "theory" only with this meaning. It seems to me that there are already perfectly good English words that correspond to the other meanings for "theory" that the

lexicographers have discerned in colloquial and learned English speech (e.g., "hypothesis," "speculation," "idea," etc.).

What theory does is to articulate, generalize, and systematize knowledge. In a theory knowledge is put into words, given broader application, and placed in relation to other things known. There are various ways of doing this. The twentieth century, following a conviction of the nineteenth century, prefers that a specially constructed language be used for the articulation (particularly that mathematics be used wherever possible), that generalization be based upon some kind of empirical experimentation and/or investigation, and that systematization be effected through the use of formal logic. But as a general preference, this expresses nothing essential about either theories or knowledge, it is more in the way of a fashion.

In the context of purposive activity it is clear that a theory can tell a person what to do (as distinct from how to do it) in particular circumstances under only two conditions. First, the person must have some further end in mind, in which case the theory says do x in the present circumstances, if you want to bring about y in the further instance. Second, the person must correctly judge the present instance to be a case of the circumstances presupposed in or covered by the theory. My point in going through this recital is to make clear that there are two things that a theory by itself cannot do. A theory cannot choose a final goal for you, nor, when you have chosen a final goal, can a theory judge for you your present circumstances.

A theory (i.e., an articulated, generalized, and

systematized body of knowledge) gives a person a powerful tool for 1) testing the knowledge comprising the theory as well as other knowledge, 2) extending the knowledge comprised in the theory, and 3) acting on present circumstances. In the context of purposive activity the last of the three is the most important. A theory may contain explicitly or implicitly detailed descriptions of kinds of possible circumstances that may be encountered and to which the theory applies, but in the end the person must judge for himself that his present circumstances are the same as those presupposed in the theory. A theory can be more or less well developed as regards application to particular circumstances.

IV. Ethics and Ethical Theory

Today (I mean, at this point in history) it is probably impossible to define ethics in a way that will avoid controversy, let alone a way that will vanquish all other proposed definitions. I will content myself with a definition that I can defend.

It will come as no surprise to you if I say that human beings have been trying to understand their own actions and those of other human beings and the effects of those actions on others and themselves for a long time. Not only to understand but also to judge; in fact there is a fair amount of evidence, historical and otherwise, to suggest that both phylogenetically and ontogenetically the urge to judge and the urge to control precede the urge to understand. This continuous attempt to understand human conduct towards others and to guide human conduct with this

understanding is called in English "ethics."[3] Ethical theory is a body of articulate, generalized, and systematized knowledge concerning human conduct. Because it is theory, ethical theory, even if correct (no matter how correctness is defined), can only offer and/or recommend means to chosen ends and facilitate both the testing and the extension of the knowledge comprising it. Ethical theory can neither choose ends nor determine whether or not a specific instance corresponds to a kind of circumstance presupposed in the theory.

For an individual concerned about his own conduct or the conduct of other people, ethical theory would be at best a useful tool. In its present state, at least in the West, ethical theory is a tool of very limited utility,[4] and the reasons for this limited utility are what I want next to discuss.

There have been instances of ethical theory in the West at least since the time of Aristotle. Even before that time there were compendiums of maxims and observations concerning human conduct and specific examples of applications of those maxims to specific cases --things along the lines of the second category of purposive activity that I described above. Scattered throughout Western history there are even examples of ethical theories that more or less display the twentieth century predilection for experimental foundations and logical systematization.

In the course of the nineteenth century in the West the pursuit of knowledge in general became a profession --more particularly the articulation, generalization, and systematization of knowledge became a profession. The development of engineering is one example; the growth of so

called basic science research in universities and industries is another example. Something unusual happened to the pursuit of knowledge concerning human conduct. Initially the part I have above referred to as a compendium of maxims and observations was separated from the extant attempts to further generalize and systematize that knowledge into a theoretical articulation. This knowledge was then divided up among several emerging academic disciplines. The activity of articulating and refining the knowledge contained in that compendium resurfaced then, not as ethical theory, but under the several and separate headings of history, sociology, psychology, and economics, each pursued more or less experimentally [5] by professional seekers of knowledge.[6]

Ethical theory became the exclusive property of professional philosophers who, at the same time and without anyone else taking particular notice, also arrogated to themselves the tasks of investigating and policing the production of theories in general.[7] The assumption of epistemological police powers by philosophers had no particularly overt effect on the pursuit of knowledge in areas other than ethics, because in those areas other groups were professionally concerning themselves with ascertaining and cataloguing particulars and then engaged in the construction of theories as they were inclined, paying little or no attention to what the professional philosophers thought of the performance.[8] But in ethics the best interpretation has theory construction and refinement upon an empirical base proceeding in a fragmented manner under the headings of history, etc. [9] Ethical theory meanwhile was pursued in the spirit of further

logical refinement and systematization of the point that had been reached in the latter half of the nineteenth century. Philosophers were mandated by their new job description to pay no heed to particular empirical facts, and no one was any longer systematically seeking to apply the results to particular instances.[10]

V. Casuistry

In the case of ethics, there is a special English word for the activity of ascertaining and cataloguing particular instances, formulating general principles, and systematically applying these general principles to particular cases. This word is "casuistry."[11] "Casuistry" has a negative connotation. I suspect partially because casuistry has a tendency to look like quibbling, nitpicking, and excuse making, partially because prior to the twentieth century it was done largely within the context of pastoral religion and since the nineteenth century religion has been frowned upon by the majority of educated persons. To a great extent it is also because casuistry is not theoretical, smacks of the empirical, and therefore falls outside of the job description of the professional philosopher to whom ethics has been entrusted since the nineteenth century.

That is why ethical theory is largely irrelevant. For almost a hundred years it has been cut off from the body of knowledge that could give it relevancy. The further articulation and refinement (which has proceeded apace and not stood still) of ethical theory since the turn of the century has not been informed by the "complex, socially differentiated modern world" referred to by Professor Reynolds nor by the growing body of

pragmatic knowledge of human conduct in that world.[12] Nor has there arisen alongside further development of ethical theory a body of knowledge concerning the application of this ethical theory to particular cases.[13]

Ethical theory is particularly irrelevant in the context of professional ethics because the recent concern with ethics in a variety of professions, for example, engineering, stems from a practical concern about the conduct and the results of the conduct of engineers in particular circumstances. To assume that actions with an adverse impact on oneself or others, i.e., what are colloquially and with no great precision called "unethical" actions in English, are the results of a person's ignorance of ethical principles or the person's holding faulty ethical principles is merely a way of avoiding the alternatives. The alternatives are either that the person's ethical principles are irrelevant to the situation in question or that the person mistakenly aplied the wrong principle, having failed to discern the significant distinctions in the nature of his circumstances. My point is that today the first two are the conclusions of choice, but given recent history one of the second two conclusions is more likely to be correct.

VI. Knowledge and Ignorance

My purpose in the foregoing recital was not simply, or even principally, to say hard things about philosophers and ethical theory. If ethical theory is unequal to the task demanded of it today, i.e., to effectively provide guidance and understanding to the individual in making moral choices, then we need also to examine the nature of the demand and the task. The circumstances

I have just described, which led to the peculiar plight of ethical theory today, had additional consequences. As I said, the pursuit and application of technical knowledge became general career opportunities during the nineteenth century. One consequence of this development was that in the West the lines dividing ignorance and knowledge were profoundly rearranged. Greater and greater numbers of people became doctors, lawyers, engineers, scientists, etc. Such a person mastered a body of technical knowledge and made his living by applying that knowledge to meet the needs of others. Both relatively and absolutely such a person's ignorance of other bodies of knowledge, of other actors, and of other theaters of action grew.

Correspondingly the lines dividing responsibility and lack of responsibility shifted, in certain ways intensified, and in other ways became blurred. The professional became responsible for technical competence, for seeing that the very latest and best version of that competence was applied in the most competent manner to the need being met, and also for the actions of the profession as a whole. The layman became correspondingly less responsible in each of these areas. Each professional also mirrored the layman with respect to other professions. It also became increasingly unclear who was responsbile for the unintended effects of technically competent application. There also corresponded to these shifts a shift in the standards that were applied in judging the application and effects of technical competence. Standards developed within a profession, based on the imperatives inherent in the social organization of the

profession and in the nature of the technical knowledge upon which the profession was based, increasingly displaced more general social standards and the individual standards of the professional's "client."

This process, which was set in motion by the professionalization of the pursuit of knowledge and of the application of knowledge, can be summarized in two sentences. The individual in Western society became increasingly ignorant both of the causes of consequences that he experienced and of the effects of his own actions. At the same time Western society was increasingly compartmentalized into groups that, while increasingly ignorant of each other, were nonetheless increasingly linked together by the technical progress that was also contributing to the mutual ignorance. This is the stuff of clichés and ritual lamentations in twentieth century Western society, and yet it points to an underlying reality.

Now, a philosopher is supposedly under the professional obligation to reflect on the actions of others and on his own actions as well. I therefore want to point out that in the first part of my remarks I was speaking on the basis of my own technical competence without the space or time to attempt to demonstrate, except very sketchily, the correctness of my pronouncements. In the second part I moved into a historical analysis for which I have no professional credentials and again without the space or time to present to you the evidence that supports this historical interpretation. I do not want anyone to take my word on these things. I hope only to have made them plausible. I can present to you only indirectly the strongest

evidence for the plausibility of the analysis. Ask yourself how you would go about determining whether what I have said is true or false and suppose that something important depends upon whether it is true or false.

VII. Professional Ethics

I believe something important does depend on it. It is not an accident that there is now a wide concern with professional ethics --medical ethics, engineering ethics, political ethics, legal ethics, etc. Something is seriously wrong. If I am right in my analysis, the solution that has been pitched upon stands the situation on its head. The problem is not an absence of ethics in engineering, for example. Rather, the problem is a lack of engineering in ethics.

Ethics, more particularly ethical theory, is now being called in to straighten out the mess. This is merely another symptom of the underlying cause that I have described. (Yet another professional is called in. The logical outcome, and I am not being facetious when I say this, for I have participated in several serious discussions on the subject, is yet another speciality called ethics and philosophy, which is concerned with the ethical issues involved in philosophizing, and at this very moment careers are being built upon it.) To bring in ethics has meant bringing in the philosopher with his utilitarianism (rule or act), his deontological ethics, and his theories of justice to sort out what is right and wrong in the profession. Or it has meant having the practicing professional learn utilitarianism, deontology, or Rawls' theory of justice and have him do the work.

Or turning again to the philosopher, have him teach utilitarianism, etc. to students in the professions.

But these tools (utilitarianism, deontology, theories of justice and their many variants) are at present all unequal to the task. They embody principles that were all developed in a time when people knew more about both the actions that effected them and the results of their own actions, when the circuits of causality upon which responsibility is elaborated were simpler and less ramified, and when a person was a member of a limited set of associations. What is needed is a healthy dose of casuistry and that which casuistry presupposes. A compilation and cataloguing of particular cases in all their myriad details, to which ethical principles can be systematically applied, is more likely to lead to the formulation of principles that are appropriate to the present situation.

VIII. Ethics and Engineering

As an example, the vast majority of so called ethical dilemmas or issues in engineering with which I am acquainted can be analyzed down to involving one or more of the following:

* the engineer assumes that others share his values;
* the engineer is ignorant of the nature of a situation that is affected by his actions;
* the public, client, or employer has unjustified or unjustifiable expectations;
* no one was/is minding the store;
* the engineer's only effective control over an association to which he belongs is limited to leaving or staying.

In each of these areas the questions that need to be asked and answered for a large number of specific incidents and cases are:

In what variety of ways does this arise?

Under what different circumstances does this occur?

What are the different roles an engineer can play in a given set of circumstances?

What variety of causes underly these ways and circumstances?

What variety of remedies are available?

These lists are largely the result of my work in engineering ethics. They are certainly not exhaustive and most certainly do not contain some items that would result if you considered other professions. Speaking as a philosopher, however, the list does suggest to me that a number of issues need to be examined:

* to what extent should we hold a person responsible for what they know?
* to what extent should we hold a person responsible for what they do not know, for their ignorance?
* to what extent should we hold a person responsible for their associations?
* to what extent should we hold a person responsible for unintended consequences of actions?

Which in turn suggests to me that for engineering at least our received (read: utilitarian, deontological, etc.) concepts of personal and group responsibility and attendent ethical principles need to be examined. What the list does not help me with at all is determing what may or may not be appropriate concepts and principles. I would want concepts and principles

that would adequately cover most, if not all, relevant cases in their myriad detailed individuality. For that we need and do not yet have the results of contemporary casuistry.

Stephen Unger opens his book on ethics and engineering, Controlling Technology: Ethics and the Responsible Engineer, with the following schematic description of what he says is an actual incident.

> An engineer is given the task of taking periodic samples of the effluent from a small chemical company's outfall pipe to a river in order to meet the requirements of an EPA discharge permit. The sampling location was selected by a representative of the state health department.
>
> The sampling program consistently indicates a pollutant rate well within the allowable limits. Surprised at this, the engineer investigates and discovers that the sampling site has been incorrectly chosen: the main discharge is through a deep pipe not visible from the surface.
>
> Revealing the existence of the overlooked pipe could expose the company (the engineer's client) to a major expense in order to lower the actual pollution rate to within the limits of the discharge permit. Since the sampling site was actually chosen by the health department, the engineer would be in no legal jeopardy if he remained silent.[14]

Professor Unger suggests that the law provides no guidance in a case like this,[15] and he moves on to discuss the circumstances, first, in terms of professional responsbility and, second, in terms of possible personal consequences to the engineer. There is apparently no question in Professor Unger's mind that the engineer in this case has a responsibility to do something, based on the facts that he knows something and that something is likely to have harmful effects on others. This is not surprising, for on this question all the engineering codes of ethics are

unanimous, and these codes are based on the received theories of ethics which are in turn unanimous on this question. Thus, the problem as it appears to the individual caught up in these circumstances is not really one of not knowing what to do, rather it is the problem of knowing not only what to do, but also knowing the likely consequences of doing it.

But my question is, nonetheless, is it really so obvious that engineers in such circumstances ought to be held to a responsbility to act? Set aside for a moment your received ethical standards and try to answer the question in what I have suggested above is the original form which ultimately gives rise to ethics. What is the end or ends we have in view, and what is the best way to achieve it or them? If on reflection you want to retain such a responsibility, are there any nullifying circumstances? Is there perhaps a small number of special circumstances in which you want to invoke the responsibility and perhaps a greater number of similar circumstances in which you do not want to invoke it?

I do not have an answer to this question, because today there is no answer. An effective answer could only come at the end of a casuistic investigation (preferably abstracted as much as possible from any reliance on received ethical principles) -- an investigation into the full implications and consequences of cases like this carried out by a large number of people. Actually, I do have an answer --I am inclined to argue against invoking such a responsibility in all but a special subset of such cases. But rather than argue for my solution, I would

prefer to describe the reflections that prompted me to first consider this question.

This engineer had no effective control over the placement of the discharge pipe, no effective control over the pollution standards being applied, no effective control over the choice of the sampling site, and no demonstrated control over the actions of his client/employer. Clearly the end in view is that the harm due to pollution cease, and it is assumed that just by making the situation known this end will be achieved. Otherwise, why load the responsibility on the engineer? And yet that assumption does not strike me as all that likely. What certainly is likely, but by no means certain, is that the bad consequences to the engineer that can result from his making the fact known will indeed occur. Then I think, yes, but he knows and, although he may not be the person best placed to effect a solution, whoever that best person is cannot act until they know. That thought in turn prompts me to ask, why is it that only the engineer knows? It is not because he is an engineer (i.e., the possessor of a special and arcane knowledge). It does not take any esoteric knowledge to understand that pollution poses a hazard to peoples' health. Why is it that the health inspector did not take more care to ascertain the correct sampling site? Why is it that the citizens of the districts downstream do not take the trouble to exercise oversight on the health department? Why has no professor from the local college looked into the technical competence of pollution monitoring activities in the area? Why have local engineering society chapters not concerned themselves with looking into averting such situations? [16] To my mind, more

plausible arguments can be made for placing the responsibility on any one of these individuals or groups than on the engineer in this case. But the kind of general principle we would want to frame and invoke in such cases depends less on ethical considerations than it does on an assessment of the frequency of such situations, the various kinds of circumstances under which they can occur, significant factual differences that occur in such cases, and the effects of different social arrangements on the outcomes of such cases. In other words, casuistry.

The final question is, of course, who should undertake this task? There is nothing in the training, experience, or knowledge of philosophers that particularly well suits them to undertake this work, other than the fact that they experience as much as anybody does the consequences of the actions of engineers. The answer is that at least initially engineers, by experience rather than training, are best qualified to do this, and it would be best done as much as possible in the absence of any preconceptions about ethical theory.

IX. Conclusion

In conclusion, I want to make several anecdotal observations. When I first began to teach and work in an engineering department, I was appalled at how vague and erroneous an idea engineering students had of engineering practice, of what was involved in earning one's living and making one's career as an engineer. I was also appalled by how little practicing engineers knew of the lives and work of other groups in society. This was also true of students, but it seemed at the time somehow

less reprehensible in their case. After living and working for a while in the no man's land that lies between two academic specialties, it occurred to me that this situation is not peculiar to engineers. It is not even peculiar to the academic milieu in which I was then working. It is in fact endemic to at least the upper socio-economic half of developed Western society. It also occurred to me, despite ritual protestations to the contrary which arise whenever the subject is discussed, that on a day-to-day basis this ignorance creates a very comfortable situation, particularly from the perspective of the individual. A person can know a great deal about an area of small compass and appparently not bother, and it is a bother, to inform him or herself about the rest nor be effectively confronted by the questions and concerns that arise elsewhere. The value to the individual of this comfort is consistently underestimated. Therefore, also, the resistance of individuals to changing this situation is consistently underestimated.[17]

Ignorance is the problem. Ethical theory is irrelevant to this problem, because the ignorance that is the problem is not ignorance of ethical theory, and ethical theory tells us nothing about how to remove the ignorance that is the problem.

FOOTNOTES

1. The detailed analyses that support this typology and the assertions I have made about it have been performed by the members of the so-called Erlanger School lead by Paul Lorenzen. See, in particular, Normative Logic and Ethics (Mannheim: Bibliographisches Institut, 1984) and "Methodisches Denken," in Methodisches Denken (Frankfurt: Suhrkamp, 1968), both by Lorenzen. See also H.-G. Gadamer, "The Scope and Function of Hermeneutical Reflection," in Philosophical Hermeneutics (Berkeley, CA: University of California Press, 1976). See also, K. R. Pavlovic, "Science and Autonomy: The Prospects for Hermeneutic Science," Man and World 14 (1981): 127-40.

2. THEORY: The American Heritage Dictionary of the English Language

   1a. Systematically organized knowledge applicable in a relatively wide variety of circumstances; especially, a system of assumptions, accepted principles, and rules of procedure devised to analyze, predict, or otherwise explain the nature or behavior of a specified set of phenomena.

   1b Such knowledge or such a system distinguished from experiment or practice.

   2 Abstract reasoning; speculation.

   3 Broadly, hypothesis or supposition.

   THEORY: The Oxford English Dictionary

   1 A sight, a spectacle.

   2 Mental view, contemplation.

3 A conception or mental scheme of something to be done, or of the method of doing it; a systematic statement of rules or principles to be followed.

4a A scheme or system of ideas or statements held as an explanation or account of a group of facts or phenomena; a hypothesis that has been confirmed or established by observation or experiment, and is propounded or accepted as accounting for the known facts; a statement of what are held to be general laws, principles, or causes of something known or observed.

4b That department of an art or technical subject which consists in the knowledge or statement of the facts on which it depends, or of its principles or methods, as distinguished from the practice of it.

4c A systematic statement of the general principles or laws of some branch of mathematics; a set of theorems forming a connected system: as the theory of equations, of functions, of numbers, of probabilities.

5 In the abstract (without article): systematic conception or statement of the principles of something; abstract knowledge, or the formulation of it: often used as implying more or less unsupported hypothesis.

6 In loose or general sense: A hypothesis proposed as an explanation; hence, a mere hypothesis, speculation, conjecture; an idea or set of ideas about something; an individual view or notion.

3. ETHICS: The American Heritage Dictionary of the English Language

1a The study of the general nature of morals and of the specific moral choices to be made by the individual in his relationship with others; the philosophy of morals.

1b The moral sciences as a whole, including moral philosophy and customary, civil, and religious law.

2 The rules or standards governing the conduct of the members of a profession.

3 Any set of moral principles or values.

4 The moral quality of a course of action; fitness; propriety.

ETHIC: The Oxford English Dictionary

1a The science of morals.

1b A scheme of moral science.

2a [plural] The science of morals; the department of study concerned with the principles of human duty.

2b A treatise on the science.

2c Ethical maxims or observations.

3a The moral principles or system of a particular leader or school of thought.

3b The moral principles by which a person is guided.

3c The rules of conduct recognized in certain associations or departments of human life.

4 The whole field of moral science, including besides Ethics properly so called, the science of law whether civil, political, or international.

4. I have discussed the positive aspects of this limited utility in "Autonomy and Obligation: Is There an Engineering Ethics?," in Engineering Professionalism and Ethics, J. H. Schaub, and K. R. Pavlovic, eds., (New York: John Wiley & Sons, 1983).

5. In this experimentation they have been guided by imitation of the more overt characteristics of theories in the physical sciences and the not very accurate descriptions of experiments given by physical scientists.

6. See: T. N. Clark, Prophets and Patrons: The French University and the Emergence of the Social Sciences (Cambridge: Harvard University Press, 1973); J. Donzelot, The Policing of Families (New York: Random House/Pantheon, 1979); M. Foucault, Discipline and Punish: The Birth of the Prison (New York: Random House/Vintage, 1979); T. L. Haskell, The Emergence of Professional Social Science: The American Social Science Association and the 19th Century Crisis of Authority (Urbana: University of Illinois Press, 1977); C. W. Mills, Sociology and Pragmatism: The Higher Learning in America (New York: Oxford University Press, 1966); A. Oleson and J. Voss, The Organization of Knowledge in Modern America, 1860-1920 (Baltimore: The Johns Hopkins University Press, 1979); F. K. Ringer, The Decline of the German Mandarins: The German Academic Community, 1890-1933 (Cambridge: Harvard University Press, 1969); and L. R. Veysey, The Emergence of the American University (Chicago: University of Chicago Press, 1965).

7. See: A. MacIntyre, *After Virtue: A Study in Moral Theory* (Notre Dame, IN: University of Notre Dame Press, 1981); B. Kuklick, *The Rise of American Philosophy: Cambridge, Massachusetts, 1860-1930* (New Haven: Yale University Press, 1977); B. Kuklick, "The Changing Character of Philosophizing in America," *The Philosophical Forum* 10 (Fall 1978): 4-12; H. Reichenbach, *The Rise of Scientific Philosophy* (Berkeley: University of California Press, 1951); D. Rucker, *The Chicago Pragmatists* (Minneapolis: University of Minnesota Press, 1969); D. J. Wilson, "Professionalization and Organized Discussion in the American Philosophical Association, 1900-1922," *Journal of the History of Philosophy* 57 (January 1979): 53-69.

8. Actually, some scientists, particularly in the emerging sciences, did pay attention and did try to mold their scientific practice along lines suggested by philosophers. That story is an important one, but the general thrust of pure and applied science in the twentieth century has been to ignore observations and pronouncements of philosophers.

9. Professor Reynolds' opening references to Weber give an example. Instead of an extension of received ethics adapted to the changing conditions, to the extent that anyone heeded Weber's call, it was to ignore the received ethics and the individual, as if the people who inhabited the modern world no longer were subjective nor had intentions. But of course sociology, as Weber and his followers envisioned it, was not concerned with intentions. And perhaps rightly so, but sociology alone then cannot provide a basis for ethics.

10. See: Kuklick and Wilson, above.

11. CASUISTRY: The American Heritage Dictionary of the English Language

1 The determination of right and wrong in questions of conduct or conscience by the application of general principles of ethics.

CASUISTRY: The Oxford English Dictionary

1 The science, art, or reasoning of the casuist; that part of Ethics which resolves cases of conscience, applying the general rules of religion and morality to particular instances in which 'circumstances alter cases', or in which there appears to be a conflict of duties. Often (and perhaps originally) applied to a quibbling or evasive way of dealing with difficult cases of duty; sophistry.

12. See: Hans Jonas, "Technology and Responsibility: Reflections on the New Tasks of Ethics," Social Research 40 (Spring 1973): 31-54.

13. The changes I have described here did not occur overnight. Through the 1920s one can find evidence in the philosophical journals that not all philosophers, even the professional ones, were willing to abandon casuistry. In fact, professional ethics was apparently a flourishing and sophisticated area of inquiry. It disappears from the journals, however, quite abruptly in the early thirties. The casuistic tradition was also carried on in Catholic institutions of higher education. The salient fact, however, is that for all intents and purposes casuistry

disappeared completely from the mainstream of American and European intellectual developments and institutions.

14. Stephen H. Unger, Controlling Technology: Ethics and the Responsible Engineer (New York: Holt, Rinehart and Winston, 1982), p. 1.

15. I am not sure that it is true that the law provides no guidance in cases like this. The law is not a set of specific rules in which where there is no rule there is no law. Anglo-american case law, the law of torts for example, is a case study of the process of considering similar cases, discerning significant differences, and framing general rules that cover a host of possible cases and yet allow for dealing with differences in individual cases. I am not at all sure that persons concerned with professional ethics could not learn a great deal from studying, not the law as it stands in the statute book, but the case law in its workings as an investigation and decision process.

16. Part of the answer to these "why" questions lies in the fact that the engineering profession originally constituted itself as a force in society precisely by overtly taking on this responsibility. That is why all the codes contain the provisions that apparently place this responsibility on the hapless engineer in the example. It seems to me that it was a bad bargain (ultimately even for society) and that engineers ought to consider renegotiating.

17. See: K. R. Pavlovic, "A Common Interest," Proceedings, Frontiers in Education Conference, Rapid City, SD, October 1981, pp. 196-201.

ENGINEERING AND ETHICS: SOME COMMENTS

by

Joseph Volpe

It will be my task in these brief comments to attempt to motivate and reconstruct the project that I take to be embodied in the three papers. I have chosen this tactic because I find it striking that Unger, Reynolds, and Pavlovic share, at least what I take to be, a quite similar conception of the task of professional ethics. First, I want to see if I can account for this from some of the things they say and then I want to raise a half-baked worry about that conception of the task. I will conclude my remarks with an even less baked corrective suggestion. Let me begin, then, with an attempt to motivate the Unger-Reynolds-Pavlovic project.

The Need for Professional Ethics.

We might start by asking ourselves, with respect to the conduct of the professions, what it is about our present historical situation that presses upon us the sense that, to quote Dr. Pavlovic, "something is seriously wrong." More particularly, we might begin by asking ourselves what it is about our present historical situation that accounts for that sense of malaise finding its expression in the perceived need for, what I shall awkwardly call, the moralization of the professions? These are, I believe, quite important questions. And if I may be forgiven for editorializing a bit or, worse, stating the obvious, I would like to explain why.

It seems to me absolutely crucial to any discussion of ethics in the professions that first we be able to provide a rather detailed diagnosis of the source or sources of our sense that something is indeed wrong with and in professional conduct. The importance of such an account preliminary to discussions of professional ethics should not be underestimated. For such an account would be powerful indeed --not only would it provide more articulate voice to our "sense" of trouble, but more importantly, in so doing serve to shape and give content to what is taken to be the task of professional ethics. Hence, only if we can get straight and in a rather detailed way about the source or sources of our sense of trouble in the professions will we be able to respond adequately, only then will we be able to appreciate if we are responding adequately.

Now I do not mean to suggest that the accounts of Unger, Reynolds, and Pavlovic have been negligent in this respect. Quite the contrary, each, with some difference of detail of course, provides us with a sketch of such a diagnosis. I only mean to suggest that such diagnostic accounts need to be pushed more deeply and perhaps taken more seriously given the rather crucial role such accounts play in shaping the task of professional ethics as well as fixing what will count as an adequate response. My worry, briefly put, and yet to be developed, is whether the conception of the task and hence the kind of response provided by Unger, Reynolds, and Pavlovic is adequate in light of their own diagnosis of the source of the need for the moralization of the professions.

The Diagnosis.

So what is it about our present historical situation that presses upon us the sense that the professions, in this case, engineering, stand in need of moralization?

Here the story told by Unger, Reynolds, and Pavlovic seems to me to be in the main correct. We are told, if I may simplify quite a bit, that this need arises by virtue of the convergence, better collision, of two, perhaps defining, features of modern life. Let us begin with the most obvious. Technological enterprises Professor Unger tells us have "very complex and wide-ranging ramifications". Engineering and the applied sciences, says Professor Reynolds, have "broad social impact". This point may be mundane, but it is nevertheless important. That is, one source of the need for the moralization of engineering is that typically the kinds of technologies that engineers produce or help produce have enormous impact on human welfare and hence can affect human welfare for good or ill. Someone might argue, and I think Professor Unger does, that this is sufficient to pull this activity into the moral domain. That is, anytime the interests of others are affected by an activity, that activity is to be moralized, is properly an object of moral concern and moral assessment, and hence requires self-conscious moral direction.

Though the thought that technological enterprises have enormous impact on human welfare may be sufficient to establish a general need for the moralization of engineering (though I suspect there would be many, perhaps proponents of classical capitalism, who would dispute that this feature requires any special adjustments), that thought is not sufficient, if I read

these gentlemen correctly, to capture the rather special and urgent character of the need. Rather, to appreciate the special and urgent character of the need for moralization we must consider the kind of social and/or organizational environment in which technology is developed.

Here all three have something very important to say, and I wish I could do justice to their remarks on this matter. In short, however, we are reminded that technological enterprises are pursued in a "complex," "differentiated," "compartmentalized," organizational and social environment. This structural point about the nature of modern organizations is quite important because in such an organizational environment decision-making, we are told, is "diffused" and the "lines of responsibility obscurred." As Dr. Pavlovic ably points out, in such a "compartmentalized" bureaucratic environment where the lines of responsibility are blurred or, worse, obliterated, it becomes quite unclear who is responsible for the unintended and harmful effects of technically competent application. In such an organizational environment by virtue of its very structure one might be inclined to say simply that no one is responsible; because in such an organizational environment there seems no room for a notion of responsibility other than that of technical competence. Hence, as a result of the diffused, compartmentalized, differentiated organizational environment those engaged in technical pursuits can be seen to be cut off or alienated from how those endeavors engage human welfare. Accordingly, from within such an organizational environment one's

vision is narrowed and fractured and consequently so too is one's sense of responsibility. Thus, the structure of modern organizations might be said to conspire against moral concern and moral direction by denying them the conditions of life.

Here we have a collison of two thoughts: first, the thought that technological enterprises have enormous social impact and accordingly can affect human welfare for good or ill and hence require moral control and direction; and second, the thought that the very nature of the organizational environment in which these technologies are developed conspires against moral control and hence squeezes the life out of the possibility of moral direction. This looks to be a problem indeed. And it is these thoughts that rightly press upon Unger, Reynolds, and Pavlovic the sense that "something is seriously wrong".

Hence, according to Unger, Reynolds, and Pavlovic the source of the need for the moralization of engineering is twofold. First, the consideration of social impact generates a general need. And second, the nature of the modern organizational environment gives that general need a rather special, specific, and urgent character.

The Task of Professional Ethics.

Now against this diagnosis and understanding of the special need for the moralization of engineering what do Unger, Reynolds, and Pavlovic see as the task; that is, how do the three think the required moralizaiton is to be accomplished? Here I think it is fair to say that each, though I think Dr. Pavlovic might object to this characterization, sees the task as one of providing guiding principles of conduct. Presumably, principles of conduct

are thought to be able to function in such a way as to counteract organizationally-induced myopia by guiding engineers through the otherwise befogged landscape of modern bureaucracies. Principles of conduct are thought to be able to provide a kind of moral searchlight and hence the task is seen to be the construction of principles sensitive to the special problems of engineering and the organizational environment in which engineers work.

The Response.

It is, quite clearly, the task of constructing guiding principles of conduct that motivates the particular positive proposals made by Unger, Reynolds, and Pavlovic. Professor Reynolds, for example, feels the need to supplement the otherwise compelling model of moral agency articulated by Neibur (a model that interestingly emphasizes the importance of "vision" and "discerning judgment" and not principles of conduct) with "principles of responsibility." The supplementation is required because, presumably, "man the responder" is inadequate in the modern organizational environment. "Man the responder" is inadequate in the modern organizational environment because his vision, and hence his appreciation of the situation, is necessarily restricted by virtue of organizational constraints. The "principles of responsibility" offered by Professor Reynolds are thought, I take it, to force a wider view thereby, making room within the organizational setting, despite and hence in the face of its structural restrictions, for a wider view, a wider concern, and a wider sense of responsibility. If this is the correct reconstruction of Professor Reynolds' position about the

need for and use of his "principles of responsibility," then it shows just how seriously he takes the second source --the nature of the modern organizational environment-- as contributing to the need for the moralization of engineering.

Professor Unger responds much in the spirit of Professor Reynolds. Conceiving of the task similarly, Professor Unger responds not with "principles of responsibility," but rather a "professional code of ethics." But differences aside, the "code," I take it, is to function much like Reynolds' "principles." Simply put, the code is to guide conduct by alerting the engineer to wider concerns and hence a wider range of responsibilities. Like Professor Reynolds' "principles," Professor Unger's "code" is an attempt to compensate for the fractured and fragmented vision and the consequent blurring or obliteration of responsibility fostered by the structure of modern organizations. Hence, like Reynolds' "principles," Unger's "code" shows just how seriously he, too, takes the second source as contributing to the need for the moralization of engineering.

Dr. Pavlovic's response fits the Reynolds/Unger mold though with a somewhat interesting twist. The interesting twist is that Pavlovic's own casuistic proposal --still another version of the guiding principles response-- is offered by way of a polemic against philosophical accounts of morality. Now as much as I would like to defend philosophy against Pavlovic's invective, what interests me is that the polemic and the proposal are linked. Philosophical accounts are targets of abuse for Pavlovic just because they cannot, by virtue of their generality and/or

abstractness, provide detailed and specific guidance for the particular kinds of problems living and breathing engineers face in the particular kind of organizational environment in which living and breathing engineers work. Hence, the rationale behind Pavlovic's polemic is the judgment that philosophical accounts cannot be applied to and in the organizational environment in which engineers work. Philosophical accounts fail the tests of specificity and hence relevance.

Consequently, it is Pavlovic's view that rather than, say, the principle of utility what is required are principles that address the specific realities of the engineer's environment and hence are capable of guiding conduct. It is in this context that Pavlovic offers his own casuistic proposal. But what is significant and to what I wish to call attention is that Pavlovic's polemic and proposal are linked. The polemic and the proposal are linked by the thoughts that (1) the task with respect to the need for moralization is to provide guiding principles, (2) the principles provided are to guide conduct by compensating for the fractured and fragmented vision and consequent blurring or oblitertion of responsibility fostered by the structure of modern organizations, and (3) in order to guide conduct in the required way the guiding principles must meet the tests of specificity and relevance. Hence, like Reynolds' "principles" and Unger's "code," Pavlovic's polemic and proposal show just how seriously he, too, takes the second source as contributing to the need for the moralization of engineering.

I think it clear, then, that Reynolds, Unger, and Pavlovic take very seriously indeed the second source for the moralization of engineering. Moreover, all three conceive the task --how that moralization is to be accomplished-- to be the construction of guiding principles of conduct. Finally, all three respond by attempting to provide principles with the requisite specificity capable of guiding conduct in the environment in which engineers work.

The Worry.

About the Reynolds, Unger, Pavlovic task and response I have a deep worry, and my worry is this. I am concerned whether principles of responsibility, or moral injunctions about truth-telling and promise keeping, or a casuistry abstracted from particular cases that confront engineers are up to satisfying the need for moralization having the twofold source indicated previously. In particular, I am concerned whether, given the source that gives the need for moralization its special force and character, formulations of guiding principles will be --can be-- effective at all. If it is true, and I do think it is, that our sense of something being seriously wrong has its source in the nature of the very organizations in which technology is developed, I do not see how, to put the matter somewhat hyperbolically, arming the 1985 Lehigh graduating class with maxims for conduct can engage forcefully that need for moralization. Rather, what the earlier diagnosis naturally suggests --one might say demands-- is the need for structural changes in the very organizations in which engineers work. There need to be organizational mechanisms developed for moral

direction. Without deep structural changes in the organizational work environment I do not see how guiding principles can be made to work, because in the face of the amoralizing structure of the modern organization I do not see how principles or codes or a casuistry can themselves, by themselves, create that room or those mechanisms. Given that engineers typically work in an organizational setting, guiding principles are unlikely to be effective because without deep structural changes such principles, to borrow an idea of Pavlovic's, will not be relevant to the engineer's world. The conceived task and subsequent response of Reynolds, Unger, and Pavlovic is, I would suggest, radically mismatched vis-à-vis the second source of the need for moralization. That source --the very source that all three take so seriously-- and the Reynolds/Unger/Pavlovic task and response are not "made for each other". It may be that guiding principles are more appropriate with respect to relatively autonomous professionals like physicians, but it seems to me not so helpful here for the reasons indicated.

A (Very) Modest (And Undeveloped) Proposal.

Now perhaps someone might object to what I have said about the inadequacy of the Reynolds/Unger/Pavlovic response as follows: "Look, you are never going to get those kinds of deep structural changes, at least not for a long time, and the need for moralization is pressing and so formulating guiding principles of conduct is the best we can do under the pressure of the moment."

But even if it is true that a radical attempt to overhaul organizations in such a way that moral concern will be reflected in their very structure is not practical, I think we might be able to do better than formulating guiding principles of conduct. Perhaps better than arming engineers with principles of conduct we should alter, at least a bit, perhaps quite a bit, the nature of the engineering curriculum and alter it to include moral education. That the present engineering curriculum with its tremendous emphasis on technical competence at the exclusion of all else conspires with the modern organizational environment to squeeze the life out of moral concern is to my mind obvious, that the university contributes to the need for moralization is to my mind troubling. Accordingly, one place to start to address this sense that there is "something seriously wrong" is with the education, the moral education, of engineers.

By moral education I do not mean, conceding to Pavlovic's criticisms of philosophical accounts of morality, equipping an engineer in an academic setting with the principles of utility or some such other abstract philosophical conception. I agree such would be irrelevant with respect to the realities that will be faced by that engineer, just as I have tried to suggest that equipping her with more specific principles would be irrelevant in virtue of the fractured and fragmented organizational environment. Rather, what I mean by moral education is something broader and more comprehensive; say, exploring with student engineers the kind of environment in which they will likely find themselves working, the kinds of restrictions they will find placed on them by that environment, acquainting them with the

likely consequences of those organizational constraints for their own sense of responsibility, exploring with them alternatives to the moral deadening of the work environment, exposing them directly to the need for moral concern, making vivid the systematic interconnections of the social system and the effects technology has on human welfare. Naturally, the curriculum change that I have just sketched is as it stands underdescribed. But what, in short, is needed is a curriculum change that features moral education (not to be confused with the taking of one course) relevant to the situation in which an engineer is likely to find herself. Moreover, this should be a curriculum change that has status and prestige and is therefore seen as an integral part, as much a part as the technical courses, of an engineer's education. In addition, since engineers are likely to work in corporate structures, this moral education should be expanded to include future corporate managers. It is common, I believe, for professional ethics courses to be designed to speak to a specialized audience. But, if the source for the need for moralization is the structure of the modern organization, then we might do well to speak to all those who will be a part of those organizations together, rather than isolating them from each other by way of specialized courses and thereby playing into the very compartmentalization that is supposed to be the source of the problem.

Indeed, if we were to take quite seriously the source of the need for moralization we might see our way to comprehensively realigning the education of those who are going to work in the

modern organizational environment. The attempt to produce morally sensitive persons, in the absence of deep structural changes in the organizations in which professional activity is conducted, seems to me a more effective means to achieve moral concern and direction than the construction of guiding principles. For the alternative of moral education would represent, at least, a modest structural change, and hence would be more in keeping with the second source of the need for the moralization of the professions.

THE NATURE OF ENGINEERING ETHICS: PRELIMINARY CONSIDERATIONS

by

Heinz C. Luegenbiehl

In the last fifteen years there has been a rapid growth in the literature on applied ethics. As part of this movement, serious academic consideration of ethical issues in engineering was a relatively late development. As Robert Baum wrote in his 1980 report on the state of engineering ethics: "Although a great deal has been written in the area of engineering ethics, there is a dearth of good material available at present....Almost everything published to date...has been written by engineers representing the 'establishment' position."[1] Even now a clear focus for an engineering ethics, analogous to the long-established focus in medical ethics on the physician-client relationship, has not yet been fully developed.

Engineering, because of its intimate relationship with a broad range of societal and human concerns, faces a number of special problems when an attempt is made to delimit and focus the normative questions which apply to it. In the initial phases of the discussion it seemed more important to deal with ethical issues in engineering in the concrete than being concerned about their theoretical foundation, so that engineers would receive at least some critical exposure to the ethical dimensions of their work experiences. However, it is perhaps now time to look beyond the concrete moral perplexities which face engineers and begin to develop a framework which is capable of clarifying the

theoretical status of engineering ethics. In this essay it is my intention to make a contribution to this process by determining whether or not engineering ethics can be classified within the scope of an already established category of applied ethics. Specifically, I will briefly examine three likely candidates for the assimilation of engineering ethics: professional ethics, business ethics, and technological ethics. Each of these categories has been proposed as the central focus for an engineering ethics. By contrasting the three positions, however, it will become apparent that engineering ethics requires a unique conceptual model.

The Legitimacy of the Issue

Before attempting a categorization of engineering ethics, however, a prior question needs to be at least briefly addressed, lest I be accused of committing a fallacy of complex question: Can there be, properly speaking, an engineering ethics at all? The phrases "ethics in engineering" and "engineering ethics" are not necessarily synonomous, although in ordinary discourse and in textbooks they are often used interchangeably.[2] The former usage is surely unobjectionable, merely indicating reference to a form of applied philosophizing. The latter phrase, on the other hand, has clear disciplinary connotations, seemingly indicating that a special set of ethical concerns are relevant to engineering. In relation to this distinction Karl Pavlovic, for instance, has argued that while "a discussion of ethics in the context of engineering" is important, there "is no 'engineering ethics' in the strict sense."[3] He bases his position on the claim that

there are no "values, obligations, or ethical principles peculiar to engineering."[4] In the final analysis "ethics concerns all human activity, all human knowledge, and in this society that is not a circumscribable area in which one could either become an expert in the usual sense or have recourse to experts in the usual sense."[5] Thus, because there cannot be experts in ethics except in the case of the study of ethical theory, there cannot be any specific kind of applied ethics about which one could become an expert. Steven Goldman and Stephen Cutcliffe have argued a similar point of view from the perspective of technological ethics. They identify the responsibility of the engineer with "every citizen's responsibility for the social consequences of their behavior."[6] Thus, engineers "bear no special responsibility for the social consequences of their work,"[7] although they, of course, share responsibility for the course of technological developments based on their membership in the societal fabric.

The above position holds that ethical concerns in engineering are strictly contextual. Its defenders argue that in principle ethical problems encountered by engineers are no different than those encountered by other members of society, it is only the particular circumstances which require special analysis. Thus, ethical questions in engineering should be resolved on the basis of the same moral principles as are any other ethical concerns. While I have myself argued that in the teaching of engineering ethics one ought to emphasize basic moral obligations which apply to all people,[8] it seems to me that an additional distinction needs to be drawn in this regard, based

not only on the circumstances in which a moral question is to be resolved, but more importantly, based on the specific functional role of engineers in society. All engineers surely have the same basic moral obligations as does everyone else. The significant question is whether or not they have additional or special obligations based on their function, and furthermore, whether these obligations require modification of the universal obligations which everyone has, perhaps based on a conception of a "greater good" to be achieved, or whether the obligations of engineers are in harmony with the fundamental obligations of all citizens.[9] A proper understanding of the nature of engineering ethics will then not only be based on a conception of nature of ethical reasoning in general, but will also require an analysis of the role of engineering in a particular societal structure. Michael Bayles, in clarifying the role of the professions in society, puts the point in the following way: "Thus professional ethics is not simply an application of narrow ethical theory. It involves aspects of political, social, and legal philosophy as well."[10] While use of this quotation presupposes that engineering ethics is a form of professional ethics, a point I am not yet prepared to concede, it also indicates that the question "Is there an engineering ethics?" is perhaps not logically prior after all, that an analysis of the nature of engineering and its connection to other institutions in society is essential to a resolution of the question.[11] The claim that similiar ethical injunctions can be applied independently of the specific

functional context of engineering cannot be established in the abstract.

Since dealing with the question regarding the nature of engineering head on would be an undertaking far beyond the scope of this essay, I will here focus only indirectly on the issue by inquiring into the relationship of the ethical dimension of engineering to other forms of applied ethics. Is engineering ethics a form of professional ethics, a form of business ethics, a form of technological ethics, or some combination of the three? It clearly involves concerns found in each of the three disciplines. It is problematic, however, that the ethical issues pertaining to engineering can be focused exclusively in terms of one of the disciplines. The following discussion makes clear that the difference in focus in the three existing forms of applied ethics implies unique problems for the establishment of a theoretical foundation for an engineering ethics. Conceptually, issues in professional ethics are based primarily on the interaction between individuals, issues in business ethics are based on an organizational context, and issues in technological ethics have their foundation in a societal and even a global context. What then should be the proper contextual focus for engineering ethics?

Professional Ethics

The dominant extant position on this question within engineering itself is that engineering ethics is a form of professional ethics and that an analysis of ethical problems in engineering can therefore be based directly on the model of the traditional professions. This position has, however, arisen

not so much out of conceptual considerations regarding the nature of engineering as out of a historical drive within the profession itself. In the late nineteenth century engineers recognized the positive benefits to be derived from being accorded professional status by society and an intense drive toward professionalization began, culminating in the adoption of the first code of ethics for engineers by the American Institute of Consulting Engineers in 1911.[12] This code, and other early codes, were significant in that they were used to serve as an external hallmark testifying to the legitimacy of engineering as a profession. In calling for a unified code of ethics, A. G. Christie suggested in 1922 the need for a professional model of engineering: "The public knows that doctors and lawyers are bound to abide by certain recognized rules of conduct. Not finding the same character of obligations imposed upon engineers, people have failed to recognize them as members of a profession."[13] More cynically perhaps, the historian of engineering Edwin Layton has written: "For engineers, the most overt element of professionalism has been an obsessive concern for social status."[14] Ever since the early twentieth century then, engineering has presented itself to the public as a profession in the sense that medicine and the law are professions. Recent discussions by sociologists and philosophers have to a large extent assumed this perspective as a given and founded examination of ethical problems in engineering on the basis of obligations typical to the professions, although there has been an implied recognition that of the characteristics

typically applied to an analysis of the professions only a few fit engineering.[15]

Examination of the early engineering codes, however, makes one point strikingly apparent: their content is derived almost entirely from prior codes used by other professions, although in the engineering codes there is a definite lack of emphasis on the rights of professionals.[16] As a consequence, they assume that the primary role of the engineer is that of an independent practitioner in a relationship to a client, and that the proper focus of ethical concerns should therefore be on obligations to clients and to the engineering profession. Issues pertaining to group loyalty, conflict of interest, advertising, and ceremonial matters became the main focus for ethical analysis related to engineering.

The core around which these discussions have been centered has been the concept of professional autonomy, both as it applies to the individual engineer and as a means of demonstrating the true learned nature of the profession.[17] A number of proposals for ensuring that engineers can act as truly independent professionals have consequently been made. Robert Whitelaw, for example, has put forth a comprehensive bill of rights for engineers that would enable engineers to retain their ability to act autonomously even in a corporate context.[18] Dan Pletta and George Gray, in an article subtitled "A Light at the End of the Tunnel," have similarly argued that the engineering profession should work to establish a situation where engineers do not need to become captive employees, but would rather be able to

establish a relation to businesses on the level of free professionals dealing with clients.[19]

Such proposals reflect a desire to harmonize engineering with the traditional professions, but they also reflect an implied recognition that engineering, at least at the present time, does not fit the inherited model. The proposals are needed precisely because the early conception of engineering practice does not adequately mirror the position of engineers in contemporary society. It is questionable that it ever did so. As a journalist wrote in The American Machinist in 1907, "no code of ethics can be enforced which conflicts with the will of the employer."[20] The vast majority of engineers are not in fact private consultants, but are rather employed in a corporate context as salaried workers. They are dependent on specific economic conditions for the continuance of their employment, and they are required to work closely with and for individuals whose primary interest is not necessarily the furtherance of the service function to society, the condition which lies at the core of the claim to professional autonomy. Any theory of engineering ethics which fails to take account of the pressures of the marketplace and the nature of organizational structures must, at least for the present, be considered unrealistic. Yet, as Arlene Daniels had observed, this is exactly what traditional self-interpretations propose to do: "The ideal image of the relationship which has influenced the development of emerging professions is that of the free professional in a fee-for-service relationship with his client. The image is modeled upon the profession of medicine, particularly as that profession has

developed in the United States. So strong is this image that professions which never resembled this model have been influenced by it and share much of the ideology developed in its history."[21]

An adequate theory of obligation for engineers cannot be based on strictly professional considerations, for that would imply placing demands on engineers which, given their employed status, they cannot meet. A true professional ethics for engineers would require a revamping of society in its entirety. Consequently, it has cogently been argued that for engineers there are limits to professional obligations. Richard DeGeorge, for instance, has argued against the total autonomy of engineers on this basis. "But they (professionals) do not have the responsibility to make final judgments that appropriately belong to management. Typically, an engineering judgment, a legal judgment, and a medical judgment is only part of the relevant information that goes into a managerial judgment. Professionals should make their professional views and concerns known. They should insist that public safety be protected when it is clearly threatened. But they have no obligation to insist that their way of doing things be observed or that their fears carry the day in a disputed area."[22]

Business Ethics

DeGeorge's claim regarding the limitation of obligations of engineers reflects his position that business ethics "includes part of what is considered professional ethics."[23] This in turn is based on his definition of business as including "any and all

economic transactions between individuals, between individuals and profit-making organizations, and between profit-making organizations and other such organizations. "[24] Given this definition it might be even more appropriate to speak of engineering ethics as being wholly subsumable under business ethics, at least for those engineers who are employed in a corporate context. Certainly this view seems to accord with the reality of the engineer's situation, and this is reflected in standard texts on professionalism written by engineers: "At this point, a comment seems to be in order on the basic assumption that engineers must be loyal either to their profession or to their companies and cannot simultaneously be loyal to both. True professionalism could require that the interests of the client (in this case, the employer) be primary, subject to the condition that the welfare of society is not damaged, of course."[25] Based on this view, the limits of obligations for engineers would be the limits of ethical business practice. While this is not strictly DeGeorge's position, since he does recognize professional obligations, the practical effects are the same, for as he states, the limits of what is professionally required "are set not only by the code but also by the extent to which the profession as a whole is willing to support them."[26] Historically, the engineering profession as a whole has been too intimately tied to the business community to be an effective or even an ardent supporter of the individual engineer in the corporate environment.

The view that engineering ethics is subsumable under business ethics reflects an intermediate stage in the development

of engineering codes of ethics. When it was generally recognized that most engineers were employed in a corporate context the phrase 'loyalty to one's client' was typically changed to 'loyalty to one's client or employer.' Thus, if one was an employed engineer, the primary loyalty called for was to the corporation itself. When put in this way, the issue demands some reflection on the status of the corporation. What is its role in society?

A variety of answers to the question are possible. Some might stress the social contract of business with society, others the idea of the delivery of goods and services, yet others the profit-motive.[27] Each of these positions allows for the possibility of ethical demands made on the institution of business as a whole. When brought down to the level of an individual corporation, however, it would seem problematic, given the nature of American society, that any view except the profit-motive perspective can be credible. The implications of this position for the professions are stated in the strongest possible way by Albert Carr: "But the point is that the social ideals that constitute the core of professionalism must be rejected by business, if they threaten profit."[28] Even a more standard treatment of business asserts essentially the same injunction: "Few trends could so thoroughly undermine the very foundations of our free society as the acceptance by corporate officials of a social responsibility other than to make as much money for their stockholders as possible."[29] This is not to assert, of course, that the moral framework of the institution of

business as a whole cannot be transferred to the individual business. It is merely to indicate what motive should govern the individual corporation within that framework. Thus, it would seem that the engineer's duty of loyalty to the corporation implies seeking the economic benefit of the corporation limited only by the general notion of ethical business practice.[30]

At this point, however, a claim that is ordinarily considered central to the definition of engineering as well as to the professions as a whole becomes relevant, namely the idea that engineers through their training acquire knowledge and skills not available to other members of society.[31] If they have been provided by society with these abilities, it is at least plausible that, if they are in a position to exercise the abilities, they then have an obligation to do so. Put correctly, it becomes a question of the relationship between engineering judgments and business judgments. Now, it might be argued that sound business judgments always rely on the best engineering judgments, but even if this questionable claim is granted, it is still legitimate to ask to what extent engineers have a responsibility to put their knowledge and skills to use to detect potential problems arising from their work. If the economic imperative of the individual corporation is the central focus of the analysis, then the obligations of engineers are limited. Judgments regarding the extent to which engineering knowledge should be employed will fit into the hierarchical lines of authority within the corporation. A consequence of consolidating engineering ethics with business ethics then is that engineers will not be the final judges of their work. This, however,

apparently conflicts with the position of special knowledge and skills which engineers ought to have in relation to their activities. Albert Flores points to the potential conflicts created by the engineer's position: "Moreover, because the great majority of all engineers are employees of either government or business, they face ethical problems other autonomous self-employed professionals avoid. These conflicting responsibilities raise some of the most difficult ethical issues for engineers."[32]

It must be recognized that engineers most often operate within the context of a corporate structure. It is not clear, however, that their judgments can be completely limited by that structure. They have special abilities which bring with them a responsibility not limited by their role as an individual within a corporation, although that role might be assimilated with a particular interpretation of the institution of business as a whole. These responsibilities have been recognized in quite recent codes of engineering ethics as a responsibility for the welfare of society.

Technological Ethics

Engineers have a special role, based on their backgrounds, in the development of technologies. It might thus, finally, be argued that engineering ethics is most properly a technological ethics. Goldman and Cutcliffe, for instance, have stated: "Here, then is the fulcrum of a proper code of ethics for science and engineering: a systematic and detailed awareness on the part of engineers of the nature of technology as a social process and of their own work as located within that process."[33] The

position enunciated in this quotation expresses what is perhaps becoming the view of engineering ethics. The widely adopted 1974 Engineers' Council for Professional Development (now the Accrediting Board for Engineering and Technology) code of ethics states: "Engineers shall hold paramount the safety, health and welfare of the public in the performance of their professional duties." The ultimate responsibility of engineers is, on this view, to benefit society and to exercise their abilities to that end.[34]

This position has a great deal of force when the word "technology" is interpreted as representing a process of activities rather than as an end product, but it tends to deemphasize the role of the engineer's day-to-day activities highlighted by the other two positions. A major difficulty of utilizing the perspective of technological ethics is that individual responsibility for particular engineering decisions is not clearly distinguished from the responsibility of all individuals for their actions. As the reference to Goldman and Cutcliffe at the beginning of this paper indicates, it is then not apparent that one can properly speak of an engineering ethics at all.

A further consequence is that the position implies a lack of enunciable particular obligations. Technology, seen from a systematic perspective, has global implications. In the end what is at stake is the future of technological civilization as a whole. One must thus ask questions regarding the nature of technology as a totality and the aims that are to be achieved through it. The pressing question becomes: What is best for

humankind? Answering this question can never simply consist of an engineering judgment, for it involves a decision about fundamental human and societal values. When engineers are given the primary responsibility for making decisions with regard to societal benefit, however, it seems that they would have to make decisions which are based on their own particular value structures. The dangers associated with a technocratic society, governed by technological values, would then be ever-present. Samuel Florman, in arguing against such a possibility, has stated: "The engineer is no longer to be guided by his employer's wishes or instructions, or by his own creative imagination, as constrained by laws, regulations, and technical parameters. He must answer first to what his conscience tells him is best for the common good. Technethics, born of public outrages, ends by seeking solutions in private virtue."[35] Unlike Florman, I would argue that engineers should consider the public good, especially in terms of the negative injunction to avoid harm.[36] At issue is to what extent this should be the sole focus of their actions and to what extent they can be held responsible as individuals for the future of the technological system as a whole. Given the nature of our pluralistic society, it may be too great a burden to place the total responsibility on engineers within the framework of an engineering ethics. "It cannot determine which trade offs should be made between safety and economy or between growth and environmental protection. It cannot tell us what to do about armaments, nuclear or otherwise. In sum, engineering ethics cannot cover up differences of opinion

that are deep and heartfelt."[37] At the same time, however, engineers should have significant input into the process based on their particular expertise.

Conclusion

The preceding has not been, and was not intended to be an exhaustive or detailed review of possibilities for delimiting the status of engineering ethics. It should be obvious, however, that the concerns in engineering overlap with the concerns in the other three areas, yet are not circumscribable by any one of them. Thus, we need to look for a unique model which will serve the development of an engineering ethics. This model cannot be based simply on a combined statement of the three concerns, as recent codes of engineering ethics have done. These codes claim, in an absolute fashion, that one has obligations to society, to employers or clients, and to the profession. It is clear, however, that this inevitably leads to conflicting obligations.[38] Attempts to overcome this problem, such as through the claim that 'society is paramount,' actually imply that 'society should be the absolute focus' and reduces engineering ethics to technological ethics.

Nor can we take the somewhat more restricted position of Martin and Schinzinger: "Engineers, in short, must weigh their obligations to the public, their employers, their colleagues, and others when conflicts among such obligations arise. A simple, exceptionless ordering of priorities among obligations is not always possible."[39] Given this view, decision-making becomes an

ad hoc procedure, one for which no concrete guidelines are given. Surely engineers who are looking to applied philosophy for guidance deserve more.

The pressing task is to provide a substantial foundational focus for an engineering ethics. This will be a difficult task, one for which only a brief background has been provided here. Engineering ethics, as a discipline for rigorous study, is moving out of its infancy. Legitimacy as a field of study for engineering ethics now demands a more in-depth and sophisticated consideration of the basic conceptual issues than has been provided up to now. Until this is done, only an unsatisfactory parasitic relationship between engineering ethics and other forms of applied philosophy will exist.

FOOTNOTES

1. Robert J. Baum, Ethics and Engineering Curricula (Hastings-on-Hudson, NY: The Institute of Society, Ethics and the Life Sciences, 1980), p. 55.

2. Thus, for instance, in the first sustained textbook devoted strictly to engineering ethics, Mike Martin and Roland Schinzinger, Ethics in Engineering (New York: McGraw-Hill, 1983).

3. Karl R. Pavlovic, "Autonomy and Obligation: Is There An Engineering Ethics?" in James Schaub and Karl Pavlovic, eds., Engineering Professionalism and Ethics (New York: John Wiley, 1983), p. 224.

4. Pavlovic, p. 229.

5. Pavlovic, p. 224.

6. Steven Goldman and Stephen Cutcliffe, "Responsibility and the Technological Process," Technology in Society 1 (1979): 277.

7. Goldman and Cutcliffe, p. 275.

8. In "Engineering Ethics: Is Professionalization the Answer?," American Society of Mechanical Engineers, Conference Paper 81-WA/TS-12, 1981.

9. See the extended discussion of this issue in Alan H. Goldman, The Moral Foundations of Professional Ethics (Totowa, NJ: Rowman and Littlefield, 1980); see also Joseph S. Ellin, "Special Professional Morality and the Duty of Veracity," Business and Professional Ethics Journal 1 (1982): 75-90.

10. Michael Bayles, Professional Ethics (Belmont, Ca.: Wadsworth, 1981), p. 3.

11. Thus, for example, David Noble attempts to establish the intimate connection between the history of the professionalization of engineering and the nature of American society. "... the professional engineers who emerged during the second half of the last century in America as the foremost agents of modern technology became as well the agents of corporate capital." David F. Noble, America By Design (New York: Oxford University Press, 1977), p. xxiii.

12. William Wisely, "The Influence of Engineering Societies on Professionalism and Ethics," Proceedings, ASCE Conference on Ethics, Professionalism and Maintaining Competence, ASCE, March 1977, pp. 56-57.

13. A. G. Christie, "Proposed Code of Ethics for All Engineers," Annals of the American Academy of Political and Social Science 101 (May 1922): 99.

14. Edwin T. Layton, Jr., The Revolt of the Engineers (Cleveland: The Press of Case Western Reserve University, 1971), p. 6.

15. See Robert Perrucci and Joel E. Gerstl, Profession Without Community: Engineers in American Society (New York: Random House, 1969).

16. For sample early codes see Robert Baum and Albert Flores, eds., Ethical Problems in Engineering (Troy, NY: Center for the Study of the Human Dimension of Science and Technology, 1978 and 1980).

17. For expansion of this point see my "Engineering: Profession and Professionals," 1981 Frontiers in Education Conference Proceedings, Institute of Electrical and Electronics Engineers, 1981, pp. 190-95.

18. Robert Whitelaw, "The Professional Status of the American Engineer: A Bill of Rights," Professional Engineer (August 1975): 37-41.

19. Dan Pletta and George Gray, "Engineering Professionalism - A Light at the End of the Tunnel," Engineering Issues (April 1977): 157-63.

20. Cited in Monte A. Calvert, The Mechanical Engineer in America, 1830-1910: Professional Cultures in Conflict (Baltimore: John Hopkins University Press, 1967), p. 267.

21. Arlene K. Daniels, "How Free Should the Professions Be?" in Eliot Freidson, ed., The Professions and Their Prospects (Beverly Hills: Sage Publications, 1973), p. 40.

22. Richard DeGeorge, Business Ethics (New York: Macmillan, 1982), p. 234. For a somewhat different perspective on the same issue see Robert Baum, "The Limits of Professional Responsibility," Proceedings, Workshop on Values and the Public Works Professional, APWA, October 1978, pp. 9-14.

23. DeGeorge, p. 15.

24. DeGeorge, p. 15.

25. John D. Kemper, Engineers and Their Profession, 3rd ed. (New York: Holt Rinehart and Winston, 1982), p. 110.

26. DeGeorge, p. 234.

27. For a good review of these possibilities see Paul Camenisch, "Business Ethics: On Getting to the Heart of the Matter," Business and Professional Ethics Journal 1 (1981): 59-69.

28. Albert Z. Carr, Business As A Game (New York: Signet Books, 1969), p. 200.

29. Milton Friedman, Capitalism and Freedom (Chicago: University of Chicago Press, 1962), p. 133.

30. It might be the case, of course, that business itself should be considered a profession. While Norman Bowie, Business Ethics (Englewood Cliffs, NJ: Prentice-Hall, 1982), puts forth a strong case for this position, his view is more adequate as a normative proposal than as one which reflects the actual condition of business in American society.

31. Lisa Newton, "The Origin of Professionalism: Sociological Conclusions and Ethical Implications," Business and Professional Ethics Journal 1 (1982): 33-43.

32. Albert Flores, "Engineering Ethics," Business and Professional Ethics 1 (September 1977): 2.

33. Goldman and Cutcliffe, p. 279.

34. See my paper "Society as Engineers' Client," The Liberal Studies Educator 4 (1981-82): 1-10.

35. Samuel Forman, "Moral Blueprints," Harper's (October 1978): 32.

36. See Kenneth Kipnis, "Engineers Who Kill: Professional Ethics and the Paramountcy of Public Safety," Business and Professional Ethics Journal 1 (Fall 1981): 77-91.

37. Samuel Forman, "A Skeptic Views Ethics in Engineering," IEEE Spectrum (August 1982): 57.

38. Heinz C. Luegenbiehl, "Codes of Ethics" and the Moral Education of Engineers," Business and Professional Ethics Journal 2 (Summer 1983): 41-61.

39. Martin and Schinzinger, p. 161. See also Albert Flores, "The Philosophical Basis of Engineering Codes of Ethics," in James Schaub and Sheila Dickison, eds., Engineering and Humanities (New York: John Wiley and Sons, 1982), pp. 269-76.